A COMPARATIVE STUDY OF POST OPERATIVE PAIN RELIEF BY CONTINUOUS EPIDURAL INFUSION OF BUPIVACAINE WITH FENTANYL VS ROPIVACAINE WITH FENTANYL BY USING PORTABLE ELASTOMERIC INFUSION PUMP

Dissertation submitted to
THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY
In partial fulfillment of the regulations for the award of the degree of

M.D. BRANCH - X
ANAESTHESIOLOGY

K.A.P.V. GOVERNMENT MEDICAL COLLEGE, TIRUCHIRAPPALLI

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI, INDIA

APRIL 2013

CERTIFICATE

This is to certify that the dissertation entitled **"A COMPARATIVE STUDY OF POST OPERATIVE PAIN RELIEF BY CONTINUOUS EPIDURAL INFUSION OF BUPIVACAINE WITH FENTANYL VS ROPIVACAINE WITH FENTANYL BY USING PORTABLE ELASTOMERIC INFUSION PUMP"** is the bonafide original work of **Dr.M.G.RAJINISH SINGH** in partial fulfillment of the requirements for M.D. Branch-X (anaesthesiology) Examination of the Tamil Nadu Dr. M.G.R. Medical University to be held in April 2013.

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I **Dr.M.G.RAJINISH SINGH**, solemnly declare that dissertation titled, **"A COMPARATIVE STUDY OF POST OPERATIVE PAIN RELIEF BY CONTINUOUS EPIDURAL INFUSION OF BUPIVACAINE WITH FENTANYL VS ROPIVACAINE WITH FENTANYL BY USING PORTABLE ELASTOMERIC INFUSION PUMP** is a bonafide work done by me at K.A.P.V. Government Medical College, during 2011-2013 under the guidance and supervision of my Professor & Head of the department of Anaesthesiology Prof. Dr. N. JOTHI, M.D.,D.A .

The dissertation is submitted to the Tamilnadu Dr. M.G.R. Medical University, towards the partial fulfillment of requirement for the award of M.D. Degree (Branch – X) in Anaesthesiology.

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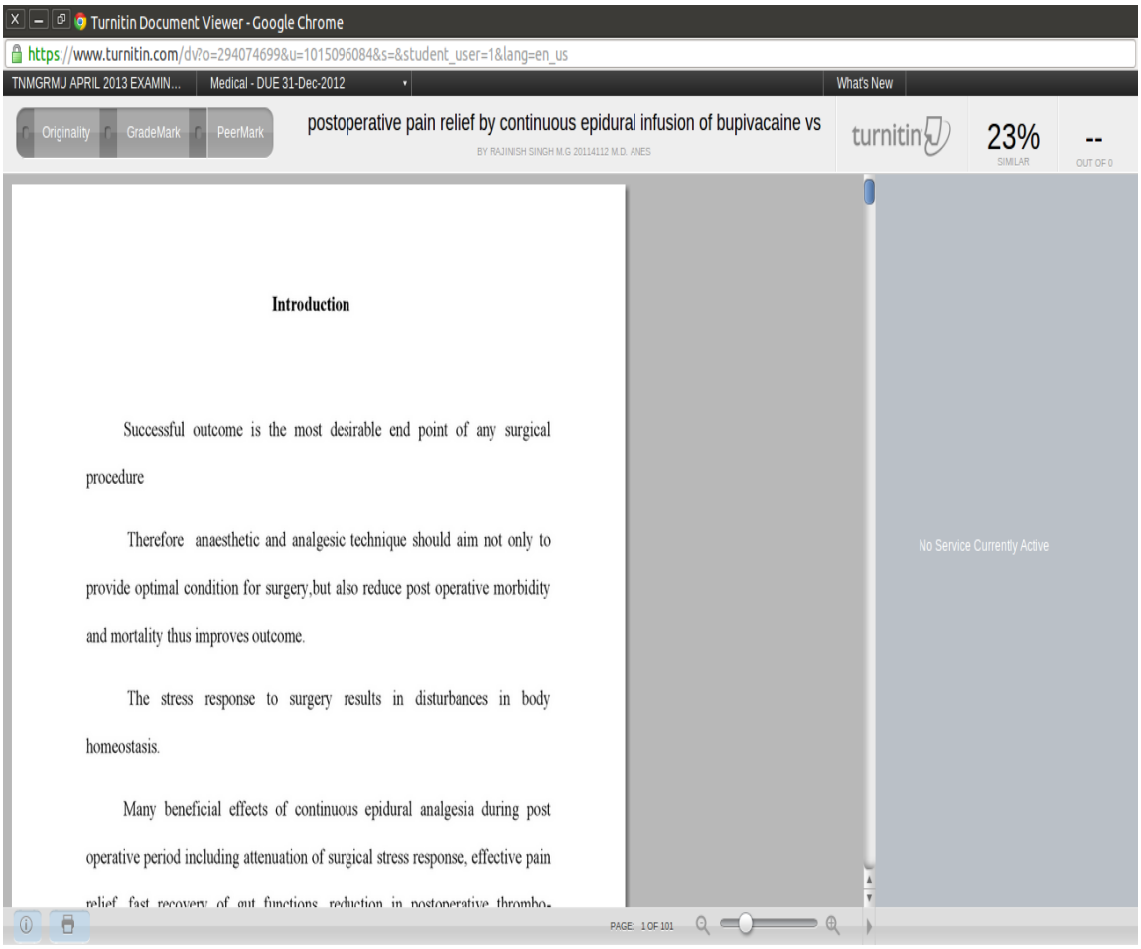
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postoperative pain relief by continuous epidural infusion of bupivacaine vs
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Introduction
Successful outcome is the most desirable end point of any surgical procedure
Therefore anaesthetic and analgesic technique should aim not only to provide optimal condition for surgery,but also reduce post operative morbidity and mortality thus improves outcome.
The stress response to surgery results in disturbances in body homeostasis.
Many beneficial effects of continuous epidural analgesia during post operative period including attenuation of surgical stress response, effective pain
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CONTENTS

INTRODUCTION

Successful outcome is the most desirable end point of any surgical procedure.

Therefore anaesthetic and analgesic techniques should aim not only to provide optimal condition for surgery, but also reduce post operative morbidity and mortality thus improving the outcome.

The stress response to surgery results in disturbances in body homeostasis.

Many beneficial effects of continuous epidural analgesia during post operative period includes effective pain relief, fast recovery of gut functions, reduction in postoperative thrombo-embolic and cardio respiratory complications.

Analgesia delivered through an indwelling epidural catheter is a safe and effective method for the management of post operative pain relief. Post operative epidural anaesthesia provides superior analgesia compared with systemic opioids.

Using combination of local anaesthetic and opioids in epidural infusion is advantageous over infusion using local anaesthetics or opioids alone.

A local anaesthetic – opioid combination provides superior post operative analgesia –improved dynamic pain relief, limits regression of sensory block, decreases the dose of local anaesthetic and decreases the incidence of side effects.

The choice of local anaesthetic for continuous epidural infusion varies. Because of differential sensory blockade with minimal impairment of motor function local anaesthetics like bupivacaine, ropivacaine, levobupivacaine are commonly used.

Epidural infusion are usually given by intermittent boluses or by using syringe pumps or electronic epidural infusion pumps.

These pumps are electrically driven and they have their own disadvantages.

The newer portable elastomeric infusion pumps can also be used for this purpose. They are safe, reliable, economic and easy to use. They operate by the action of elastomeric balloon and the drug is infused in a constant preset flow rate.

The present study was designed to compare the post operative pain relief by continuous epidural infusion of Bupivacaine with Fentanyl and Ropivacaine with fentanyl using portable elastomeric infusion pump.

AIM OF THE STUDY

TO COMPARE THE POST OPERATIVE PAIN RELIEF BY CONTINUOUS EPIDURAL INFUSION OF BUPIVACAINE WITH FENTANYL AND ROPIVACAINE WITH FENTANYL BY USING PORTABLE ELASTOMERIC INFUSION PUMP.

HISTORY

1885 – American neurologist JAMES LEONARD CORNING (1835- 1723) was the first to give neuroaxial block . He injected 111 mg of Cocaine in Epidural space of healthy male volunteer.

1921 – Spanish military surgeon FIDEL PAGES (1886- 1923) developed the technique of single shot epidural. Later popularised by Italian surgeon ACHILLE MARIO DOGLIOTTI (1897)

1941 – ROBERT ANDREW HINGSTON and WALDO B EDWARDS developed the technique of continuous caudal anasthesia using indwelling catheter. The first use of continuous caudal in a labouring women was in 1942

1947 – MANUEL MARTINEZ CURBELO (1906 – 1962) was the first to describe the placement of lumbar epidural catheter.

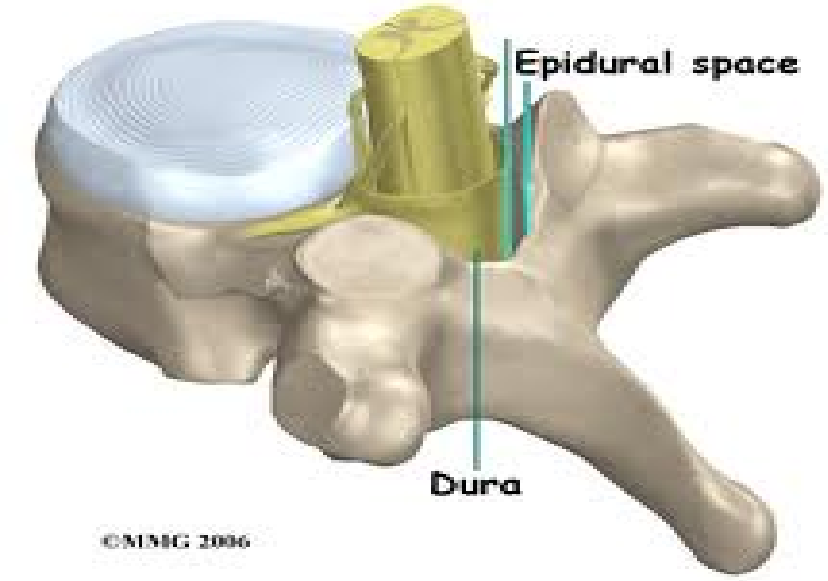
1956 – Bupivacaine synthesised by EKENSTAM.

1963 – Bupivacaine introduced in to clinical practice by TELIVUO.

1965- MELZOCK and WALTS discovered the Gate control theory of pain

ANATOMICAL CONSIDERATION

ANATOMY OF THE EPIDURAL SPACE:



Epidural space extends from the foramen magnum to the sacro coccygeal membrane and surrounds the dura mater anteriorly, laterally, and posteriorly.

Boundaries

Anterior - posterior longitudinal ligament

Lateral - pedicles and the inter vertebral foramina

Posterior - ligamentum flavum

Epidural space narrows posterolaterally and widens again laterally towards intervertebral foramina.

Compartments in the epidural space :

By using cryomicrotome, segmentally distributed compartments were observed posteriorly, laterally and anteriorly in the epidural spaces.

Injected solutions can pass from compartment to compartment, since the dura is not adherent to the canal wall.

PLICA MEDIANA DORSALIS –fibrous strand extends from ligamentum flavum to medial portion of dura producing possibility of unilateral epidural block.

Contents of epidural space :

Epidural fat

Epidural veins

Spinal arteries

Epidural lymphatics

Root of spinal nerves with dural cuff

Epidural fat :

This semifluid lobulated areolar tissue extend throughout the epidural space. It is more abundant posteriorly,diminished adjacent to articular processes and increases laterally around the spinal nerve root. Anteriorly it is sparse.

Overall the amount of fat in the epidural spaces tends to vary in direct relation to that present elsewhere in the body. Obese patients have generous amount of fat. Epidural fat is vascular with small capillaries forming a rich network in its substance. The fat has greater affinity for drugs with high lipid solubility such as bupivacaine and etidocaine which may remain in epidural fat for long periods.

Compliance of epidural fat varies between individuals and with increasing age. In children and young adults it offers little resistance, but in some adults a low compliance may result in considerable " drip back" of injected local anaesthetics.

Epidural veins :

The large valve less epidural veins are part of the internal vertebral venous plexus , they drain the neural tissue of spinal cord, the Cerebro Spinal Fluid, and the bony spinal canal.

Major portion of this plexus lies in the anterolateral part of epidural space.

Major function of the epidural veins is to drain CSF and to transfer the local anaesthetics into the CSF. In the region of the dural cuffs, bulbs of arachnoid mater protrude into epidural space. These protrusions often invaginate the wall of epidural veins that drain the spinal cord and nerve root area.

Superiorly -epidural venous plexus communicates with the occipital, sigmoid and basillar venous sinuses within the cranium.

Inferiorly – anastomosis by the way of the sacral plexus link the vertebral plexus to uterine and illiac veins.

By the way of the intervertebral foramina at each level, vertebral plexus communicate with thoracic and abdominal veins. So pressure changes in these cavities are transmitted to the epidural veins

Distension of epidural veins, owing to direct inferior vena caval obstruction or owing to increased intra thoracic and abdominal pressures, will diminish the effective volume of the epidural space with resultant increase in more widespread of local anaesthetics in the space.

Spinal arteries:

Anterior spinal artery arises from the vertebral artery. Posterior spinal arteries arises from the posterior inferior cerebellar artery.

These spinal arteries enter the intervertebral foramina and gain access to the spinal cord by the way of the spinal nerve roots.

Its is significance to epidural block that spinal branches of subclavian, aortic, and iliac arteries cross the epidural space and enters the subarachnoid space in the region of the dural cuff.

The anterior spinal artery territory supplying the anterior horn or motor areas of the spinal cord is most vulnerable to injury during epidural block.

Epidural lymphatics :

The dural cuff region is supplied with a rich lymphatic network .

These lymphatics rapidly removes debris from arachnoid villi out through intervertebral foramina to reach lymph channels in front of the vertebral bodies.

Epidural pressure :

The epidural space is identified by the negative pressure in the space . The negative pressure is created by tenting of dura by the advancing needle and transmission of negative intra pleural pressure in spontaneously breathing patients.

Positive pressure in epidural space :

Causes

Severe lung disease – emphysema

Any factor that increase intra abdominal pressure

Occlusion of inferior vena cava

During labour

Valsalva manoeuvre

TECHNIQUES OF CONTINUOUS EPIDURAL BLOCKADE WITH PORTABLE INFUSION PUMP

Epidural techniques are widely used for operative anaesthesia, obstetric analgesia, post operative pain control, and chronic pain management.

An epidural block can be given at the lumbar , thoracic and cervical levels. Sacral epidural technique is known as a caudal block.

The various approaches used for epidural blockade are

1. Midline approach
2. Paramedian approach

Various types of infusion pumps available

1. electronic infusion pump
2. syringe pump
3. portable , elastomeric infusion pump

TECHNIQUE OF EPIDURAL BLOCKADE

MIDLINE APPROACH OF LOWER THORACIC, UPPER LUMBAR LEVEL EPIDURAL PROCEDURES

Patient was placed in the lateral position. Under aseptic precaution skin was infiltrated with local anaesthetic solution upto the interspinous region. A 17 Gauge Tuohy epidural needle was inserted in the midline. Testing syringe was attached to the needle and constant pressure was maintained. The epidural space was identified by using "loss of resistance technique" to air . Then gentle aspiration was done and test dose of 3 ml of 2 % lignocaine with 1:200000 of Adrenaline was injected. 19 Guage multi port catheter was inserted and kept at the depth of 5 cm with in the epidural space and catheter was fixed on the back of the patient.

PHYSIOLOGICAL CONSIDERATION

After epidural injection , the local anaesthetic drugs bind to the spinal nerve in the epidural space, spinal nerve rootlets within the CSF and within the spinal cord. It enters in to the CSF by means of dural sleeves and spinal radicular arteries. Some of the drugs goes into the paravertebral space and block the nerves.

RESPIRATORY PHYSIOLOGY

At mid thoracic level of blockade - pulmonary function test, gas exchange and control of breathing are generally preserved in patients without pre-existing respiratory diseases.

Subjective sensation of dyspnea is due to decreased chest wall sensation with inspiration.

However tidal volume, respiratory rate, minute ventilation and lung volumes are maintained in healthy resting patients. High block height will affect accessory respiratory muscle (abdomen and intercostals) which plays major role in expiration which in turn reduces peak expiratory flow.

CARDIAC PHYSIOLOGY

Epidural blockade results in a lesser degree of sympathetic block and more CVS stability than subarachnoid block.

Blockade below T4

Low thoracic and lumbar epidural block will cause a peripheral sympathetic blockade with vascular dilatation in the pelvis and lower limb and pooling blood in the abdominal viscera. This will lead to reduced venous return thereby reduced cardiac output.

Increased activity of cardiac sympathetic fibres T1 –T4 results in increased cardiac contraction and heart rate maintaining normal cardiac output.

Blockade above T4

causes decreased heart rate and contraction by acting at cardiac sympathetic fibres T1-T4 which leads to bradycardia and hypotension.

GASTROINTESTINAL, HEPATIC AND GENITO URINARY PHYSIOLOGY

The sympathectomy of epidural anaesthesia results in relaxation of sphincters, contraction of bowels and increased secretion caused by parasympathetic predominance.

Hepatic blood flow is related to mean arterial pressure and thus maintained if the patient is hemodynamically stabe.

Like wise renal blood flow and perfusion is preserved.

BLADDER;

Temporary atonia in lumbar epidural block is due to block of S2-S4. In continuous epidural block bladder should be catheterised.

HYPOTHERMIA

Common in epidural block. It is due to heatloss to the cold environment which in turn due to sympathectomy induced vasodilatation.

PHYSIOLOGY OF PAIN

Pain perception requires noxious stimuli, that is transformed from its native form by the activated nociceptors to electrical signals which are then transmitted along the corresponding nociceptive fibres . These fibres in turn synapse to second order neurons in the spinal cord. These interneurons are located in the dorsal horn. It is at these interneurons where the initial modulation of nociceptive input occurs. From the spinal cord nociceptive input is transmitted to the brainstem, thalamus and cortex.

Peripheral neuroanatomy of nociception

C and A fibres are the main peripheral nociceptors. The skin, joints and periosteum are richly innervated with C and A nociceptors as well as the non nociceptive AB sensory fibres.

'A' fibres are responsible for sensation of first pain, initial sharp pain experienced following an injury. C fibres are unmyelinated and are responsible for second pain, the slowly building throbbing burning pain experienced following an injury.

Nerve Fiber Classification[83]						
Fiber Type	**Sensory Classification**	**Modality Served**	**Diameter (mm)**	**Conduction (m/s)**	**Local Anesthetic Sensitivity**	**Myelination**
Aα		Motor	12–20	70–120	+	Yes
Aα	Type Ia	Proprioception	12–20	70–120	++	Yes
Aα	Type Ib	Proprioception	12–30	70–120	++	Yes
Aβ	Type II	Touch pressure Proprioception	5–12	30–70	++	Yes
Aγ		Motor (muscle spindle)	3–6	15–30	++	Yes
Aδ	Type III	Pain Cold temperature				
B		Touch Preganglionic autonomic	2–5	12–30	+++	Yes
		Fibers	< 3	3–14	++++	Some
C Dorsal root	Type IV	Pain				
		Warm and cold temperature				
		Touch	0.4–1.2	0.5–2	++++	No
C Sympathetic		Postganglionic sympathetic fibers	0.3–1.3	0.7–2.3	++++	No

Peripheral nerve fibers and their respective neurons are classified from A to C according to axonal diameter, covering (myelinated or unmyelinated), and conduction velocity. Sensory fibers also are categorized as I–IV. [83]

Peripheral neurochemistry and neurotransmitters

Commonly released inflammatory mediators implicated in pain and hyperalgesia include bradykinins, potassium, substance P, cytokines, histamine, serotonin, prostaglandins. These peripheral neurotransmitters either activate or sensitize the peripheral nociceptors to pain.

Peripheral neuro chemistry : Algogenic Agents

Algogenic agents	Action on nociceptors
Bradykinin	Activates
Substance P	Sensitizes
Potassium	Activates
Hydrogen	Activates
Arachidonic acid	Sensitizes
Cytokines	Sensitizes
Serotonin	Sensitizes
Noradrenaline	High concentration activates and sensitizes

PAIN PATHWAY

SPINAL CORD

The gray matter of the spinal cord is divided in to ten lamina with lamina I –IV representing the doral horn. The dorsal horn is capped by the Lissauer's tract which consist of branches of cutaneous A and C fibres and few visceral afferents.

Nociceptive fibres terminate in the superficial layers of lamina I& II, while the non- painful myelinated fibres terminate in the deeper layers of lamina III , IV . Lamina II has the highest concentration of opioids receptors in the spinal cord. Modulation and inhibition of nociception may occur at this level through the use of opioids .

Ascending sensory pathways

Peripheral sensory neurons synapse onto the secondary interneurons of the dorsal horn. The axons of the non nociceptive sensory neurons travel ipsilaterally in the dorsal column of the spinal cord as fasciculus cuneatus (upper body through T6) and fasciculus gracilis (lower body below T6) and synapse in thalamus.

The axons of the nociceptive secondary neurons after synapsing travel contralaterally in the anterolateral aspect of the spinal cord as the neospinothalamic and paleospinothalamic tracts.

Neospinothalamic tract carries fine discrimination of pain eg. location , intensity and first pain.

Paleospinothalamic tract responds to noxious stimuli. The paleospinothalamic tract synapses in the thalamus, hypothalamus and limbic system and play a role in emotional aspects of pain via limbic system. The thalamus has multiple connections to limbic system and cortex.

Descending inhibitory pathways

The descending controls of pain project specifically onto laminas I,II,V of the dorsal horn from mesencephalon, raphenuclei and reticular tract.

The mesencephalon is rich in opioid receptors. This area sends excitatory transmission to rostroventral medulla which sends noradrenaline and serotonin inhibitory tracts via dorsolateral funiculus to lamina I,II,V of spinal cord.

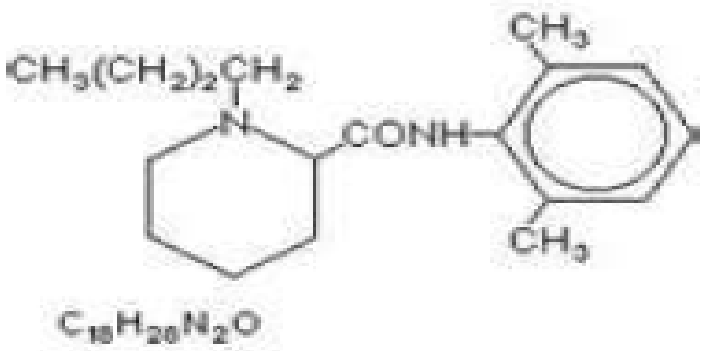
The noradrenaline and serotonin fibres mediate transmission between the primary afferents and the secondary neurons of the dorsal horn. Increased activity of these fibres leads to increased inhibition of pain transmission.

Locations of opioid receptors

Opioid receptors are found in various regions in CNS namely cerebral cortex, limbic cortex, hippocampus, hypothalamus, medial thalamus, midbrain, peiaqueductal gray matter, extrapyramidal areas, susbstantia gelatinosa and sympathetic preganglionic neurons.

Opioid receptors are also found in the cardiac sympathetic fibres, cardiac branches of vagus, adrenal medulla and gastro intestinal tract.

PHARMACOLOGY OF BUPIVACAINE



It is an amide local anaesthetic characterized as pipecoloxylidides. Addition of a butyl group to the piperidine nitrogen of mepivacaine results in bupivacaine. It is a chiral drug , because of possession of asymmetric carbon atom.

Its was first synthesized in Sweden by Ekenstam and his colleagues in 1957 and used clinically by L.J. Telivuo in 1963.

It has a molecular weight of 288.

MECHANISM OF ACTION :

It prevents transmission of nerve impulses by inhibiting passage of sodium ions through ion selective sodium channels in nerve membranes.They do not alter the transmembrane potential or threshold potential.

PHARMACOKINETICS

Its is a weak base that has pKa value above physiologic pH 7.4 .

Lung is capable of extracting bupivacaine from circulation. This extraction limits the concentration of drug reaching the sytemic circulation for distribution to the coronary and cerebral circulations. This first pass pulmonary extraction is dose dependent, suggesting that the uptake process becomes saturated rapidly.

pKa	: 8.1
protein binding	: 95 %
lipid solubility	: 28
volume of distribution	: 73 litre
clearance of drug from plasma	: 0.417 lit / min
elimination half life	: 210min
onset time	: 10-15 min

METABOLISM

Undergoes varying rate of metabolism by microsomal enzymes located primarily in the liver.

Bupivacaine has the slowest metabolism among amide local anaesthetics, it undergoes aromatic hydroxylation, N – dealkylation, amide hydrolysis and conjugation .

Only the N – desbutyl bupivacaine has been measured in blood or urine after epidural and spinal anaesthesia.

Alpha -1 acid glycoprotein is the most important protein binding site of bupivacaine.

SIDE EFFECTS

Bupivacaine is more cardio toxic than equieffective doses of lignocaine. This is manifested by severe ventricular arrhythmias and myocardial depression.

Bupivacaine blocks cardiac Na + channels rapidly during systole and dissociates slowly during diastole, so that significant fraction of Na channels remain blocked at the end of the diastole. Thus the block by Bupivacaine is cumulative and substantially greater.

CLINICAL USE :

Onset of anaesthesia and duration of action are long. Its tendency to provide more sensory than motor block has made it popular for providing post operative analgesia .

Used mainly for

Epidural anaesthesia

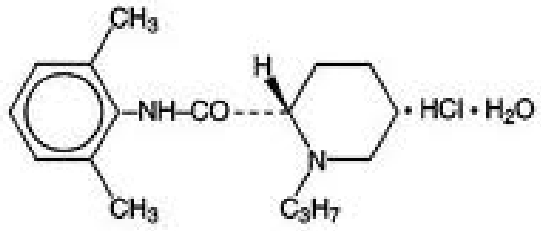
Spinal anaesthesia

Infiltration anaesthesia

Field block anaesthesia

Nerve block anaesthesia

PHARMACOLOGY OF ROPIVACAINE



Ropivacaine is a new aminoamide local anaesthetic . It is the monohydrate of the hydrochloride salt of 1 –propyl – 2 pipecoloxylidide.

Pipecoloxylidides were first synthesized in 1957 and have been in clinical use for more than 30 years. Ropivacaine has propyl group on the piperidine nitrogen atom of the molecule.

The pipecoloxylidides are chiral drugs because the molecules possess a symmetric carbon atom and they may have left (sinister) or right (rectus) handed configuration. Ropivacaine is produced as the single S – enantiomer. It has an enantiomeric purity of 99.5 % and is prepared by alkylation of S –enantiomer of dibenzoyl – L- tartaric acid.

PHYSIO – CHEMICAL PROPERTIES

The physio – chemical properties of Ropivacaine are as follows :

1 .molecular weight (base)	-	274
2. pKa	-	8.1
3. partition co efficient (N Heptane/buffer)	-	2.9
4. mean uptake ratio (rat sciatic nerve)	-	1.8
5. protein binding	-	94 %

PHARMOCOLOGICAL PROPERTIES

The relative lipid solubility of ropivacaine as measured by portioning studies between N haptane buffer and relative mean uptake into rat sciatic nerves, shows ropivacaine to be intermediate between bupivacaine and lignocaine. Plasma protein binding marginally less than bupivacaine but pKa is identical.

Onset	- moderate
Relative potency	- 6
Duration	- long acting

Mechanism of action

Ropivacine blocks the generation and conduction of nerve impulses, presumably by increasing the threshold for electrical excitation in the nerve, by slowing the propagation of the nerve impulses, and by reducing the rate of rise of action potential. The propagation of anaesthesia is related to the diameter, myelination, and conduction velocity of affected nerve fibres.

Pharmocokinetics

In human volunteer the pharmacokinetic characteristics of Ropivacine have been determined after intravenous infusion

Clearance	:	0.82 ±0.16 litres / min
Plasma protein	:	94 ±1 %
Volume of distribution	:	59 ±7 liters
Terminal elimination ½ life	:	111±62 min

Metabolism in liver by aromatic hydroxylation by cytochrome P 450 1A to 3- hydroxyl ropivacaine.

Excretion- 86 % via kidney , 1% as unchanged drug and rest as metabolites .The higher clearance of ropivacaine over bupivacine is advantageous in terms of lesser systemic toxicity.

Absorption

The systemic concentration of Ropivacaine is dependent on the total dose and concentration of drug administered, route of administration, the patients hemodynamic condition and the vascularity of the administration site.

From the epidural space, Ropivacaine has complete and biphasic absorption. The half lives of the two phases are 14 ±7 minutes and 4.2 ±0.9 hours (mean ± SD) respectively. The slow absorption is the rate limiting factor in the elimination of Ropivacaine, which is why the terminal half life is longer after epidural than after intravenous administration.

Distribution

After intravascular infusion, Ropivacaine has a steady state volume of distribution of 59 ± 7 litres .

Ropivacaine is 94 % protein bound, mainly to α1 acid glycoprotein .

An increase in total plasma concentration during continuous epidural infusion has been observed, which is related to postoperative increase of α 1acid glycoprotein.

Variation in unbound, i.e pharmacologically active concentration have been less than total plasma concentration.

Ropivacaine readily crosses the placenta and equilibrium is reached rapidly in regard to unbound concentration.

Metabolism

Ropivacaine is extensively metabolized in the liver , predominantly by aromatic hydroxylation mediated by cytochrome P450 1A to 3 – hydroxyl Ropivacaine.

Approximately 37 % of the total dose is excreted in the urine as both free and conjugated 3- hydroxyl ropivacaine . Urinary excretion of the 4 –hydroxyl and both 3 – hydroxyl and 4- hydroxyl N – dealkylated metabolites account for less than 3 % of the dose.

An additional metabolite 2 – hydroxyl methyl ropivacaine has been identified but not quantified in the urine . Both 3 – hydroxyl and 4-hydroxyl ropivacaine have not quantified in the urine. Both 3 – hydroxyl and 4-hydroxyl ropivacaine have a local anaesthetic activity in animal models less than that of ropivacaine.

Elimination

The kidney is the main excretary organ for most local anaesthetic metabolites. In total 86 % of ropivacaine dose is excreted in the urine after intravenous administration.

Ropivacaine has a mean total plasma clearance of 387 ± 107 ml /min. The mean ± SD terminal half life is 1.8 ± 0.7 hours after intravascular administration and 4.2 ±1.0 hours after epidural administration .

PHARMOCODYNAMICS

Primary pharmocodynamics (Animal studies)

These studies showed that ropivacaine at low concentration produced a profound rapid block of both Aδ and C fibres and was more potent than similar low concentrations of bupivacaine.

At higher concentrations ropivacaine and bupivacaine had similar blocking properties. Aδ fibre blocking was 16 % greater with bupivacaine and the degree of C fibre block was similar with both drugs. Ropivacaine is a potent producer of frequency dependent blocks (i.e) a block that occurs only when the fibre is stimulated. Ropivacaine blocks C fibres faster than A fibres.

Low pKa and high lipid solubility of a local anaesthetic dugs favoured A over C fibre block. The lower lipid solubility of ropivacaine over bupivacine is presumed to reduce penetration in to myelin sheath.

This greater degree of differential block with ropivacaine at low concentration and the property of producing frequency dependent block were considered to offer clinical advantage in providing analgesia with minimal motor block.

Secondary pharmacodynamics

Addition of epinephrine to ropivacaine has no limiting effect on the systemic absorption of ropivacaine . Systemic absorption can produce effects on the central nervous and cardiovascular systems. At blood concentration achieved with therapeutic doses , changes in cardiac conduction, excitability , refractoriness, contractility and peripheral vascular resistance are minimal . However toxic blood concentration depress the cardiac conduction and excitability , which may lead to atrioventricular block, ventricular arrhythmias and cardiac arrest. In addition myocardial contractility is depressed and peripheral vasodilatation occurs , leading to decreased cardiac output and arterial pressure.

Ropivacaine can produce central nervous system stimulation, depression or both. Apparent central stimulation is usually manifested as restlessness, tremors, shivering, progressing to convulsions followed by depression and coma progressing to respiratory arrest. However ropivacaine has a primary depressant effect on the medulla and higher centers . The depressed stage may occur without a prior excited stage.

Adverse reactions

A major cause of adverse reactions due to excessive plasma levels that may be due to overdosage, unintentional intravascular injection or slow metabolic degradation. Most adverse events reported were mild and transient.

Central nervous system reactions

These are characterised by excitation and depression, restlessness, anxiety , dizziness, tinnitus, blurred vision , tremors and proceeding to convulsions. However excitement may be transient or absent with depression being the first manifestation. This may quickly followed by drowsiness, unconsciousness and respiratory arrest. Other effects may be nausea , vomiting, chills and constriction of pupils.

Cardiovascular system reactions

High doses of accidental intravascular injection may lead to high plasma levels and depression of myocardium, decreased cardiac output, heart block, hypertension, bradycardia and ventricular arrhythmia including ventricular tachycardia and ventricular fibrillation and cardiac arrest.

PREPARATIONS AVAILABLE

0.2 %

0.5%

0.75%

1 %

Uses :

1 . infiltration

2. peripheral nerve block

3. brachial plexus block

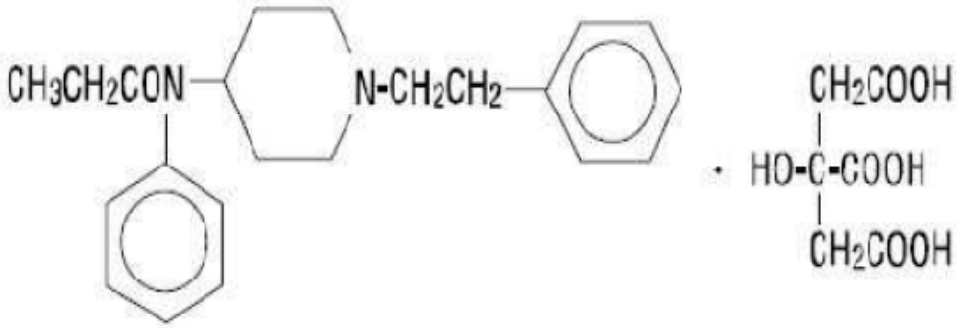
4. lumbar epidural anaesthesia

5. sub arachnoid block

6. caudal block

FENTANYL

STRUCTURAL FORMULA



$C_{22}H_{28}N_2O \cdot C_6H_8O_7$ MW 528.59

phenyl piperidine derivative, synthetic opioid agonist , structurally related to meperidine,

75 – 125 times potent than morphine.

PHARMACOKINETICS

Single dose of IV fentanyl produce more rapid onset and shorter duration of action- reflects the greater lipid solubility which facilitate its passage across blood brain barrier.

Shorter duration – reflects its rapid redistribution to inactive tissue sites to fat and skeletal muscles associated with decrease in plasma concentration.

Estimated 75 % of the initial dose undergoes first pass pulmonary uptake.

Multiple IV doses or continuous infusion of drug produce progressive saturation of these inactive tissue site – plasma concentration doesnot decreases rapidly and duration of analgesia and depression of ventilation prolonged.

METABOLISM

By demethylation produces norfentanyl and excreted in urine.

ELIMINATION HALF TIME

Longer than morphine . This longer t1/2 reflects a larger volume of distribution. Larger volume of distribution is due to its greater lipid solubility and more rapid passage in to tissues.

Plasma concentration of fentanyl are maintained by slow reuptake from inactive sites.

CONTEXT SENSITIVE HALF TIME

As a duration of continuous infusion of fentanyl increases beyond about 2 hours, context sensitive half time of fentanyl becomes greater than fentanyl. This reflects saturation of inactive sites with fentanyl during prolonged infusion and return of the opioids from peripheral compartment to the plasma.

CLINICAL USES

1. Low dose of fentanyl 1- 2 μg / kg used for intra operative analgesia.
2. Fentanyl 2- 20 μg / kg IV blunts the circulatory response to – direct laryngoscopy of intubation and sudden changes of surgical stimulation.
3. Large dose 50- 150 μg /kg used for induction – lacks direct myocardial depressant effect, does not cause histamine release, and suppresses the stress of surgery.
4. Transmucosal preparation – lozenges designed to deliver 5-20 μg /kg decreases preoperative anxiety, facilitate the induction of anaesthesia.
5. Transdermal fentanyl.

SIDE EFFECTS

Persistent/ recurrent depression of ventilation

Cardiovascular – bradycardia, Hypotension

Allergic reaction

Seizure like activity

Changes in somatosensory evoked potential

Moderate increase in intracranial tension despite maintenance of unchanged PaCO2

Drug interaction

Analgesic concentration greatly potentiate the effect of midazolam,

Decreases the dose requirement of propofol.

PHARMACOLOGY OF TRAMADOL

Tramadol is a centrally acting opioid analgesic that has a low affinity for mu receptors .

5 to 10 times less potent than morphine.

Mechanism of action:

Inhibit norepinephrine and 5 –hydroxytryptamine neuronal uptake and to facilitate 5-hydroxytryptamine release. It affect central catecholamine pathway directly by preventing norepinephrine uptake.

Tramadol is a racemic mixture of two enantiomers, one of which responsible for inhibiton of norepinephrine uptake and other is responsible for inhibition of 5 – hydroxytryptamine uptake and facilitation of its release.

A major metabolite of tramadol is O – desmethyltramadol.

Tramadol administered orally, IM or IV for the treatment of moderately severe pain.

The recommended adult dose is 50-100mg every 4 to 6 hours.

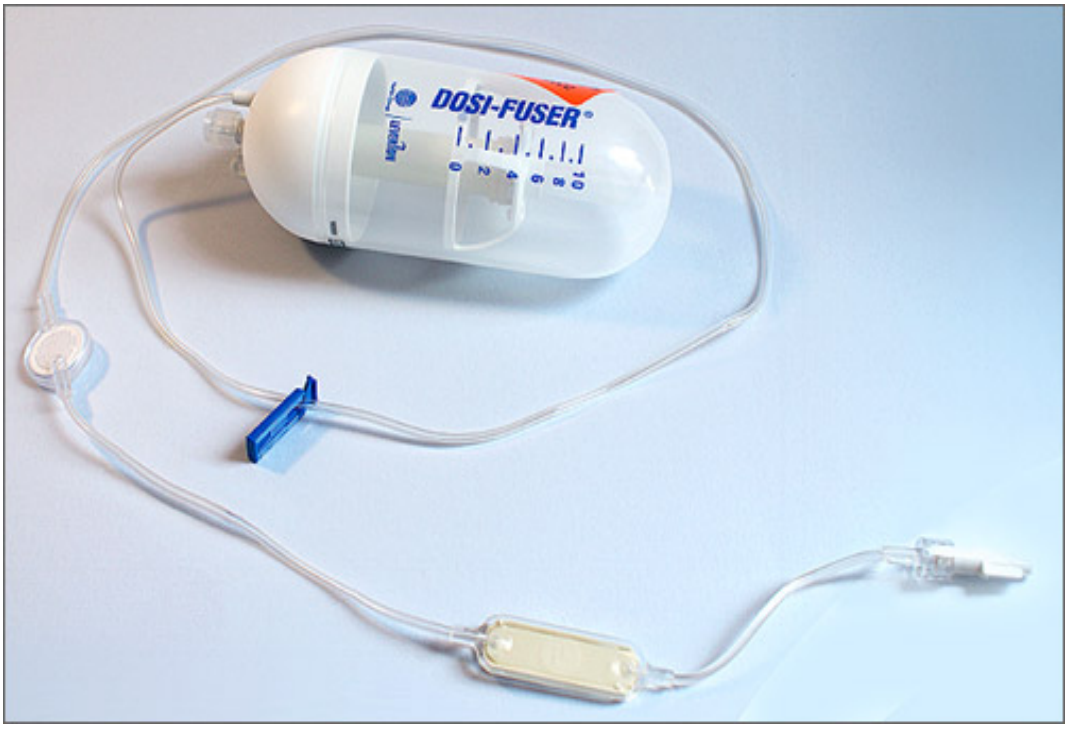
IV tramadol has an insufficient sedative effect to make it a useful drug for intraopertive administration as an analgesic.

High incidence of nausea, vomiting is a draw back to the perioperative use of this drug.

Tramadol is useful for the treatment of chronic pain because it doesnot cause tolerance or addiction.

Seizure have been associated with tramadol administration especially in patients receiving concomittent treatment with antidepressant.

EPIDURAL INFUSION PUMPS



This is portable, manual , elastomeric pumps

Contains

1. Air and portable filter
2. Capillary design reduces obstruction
3. No battery or electrically driven – can shower with it
4. Disposable and easy to fill with hands
5. Large capacity
6. Available in fast and slow flow rates

Advantages of portable infusion pump

1. Safe and simple , reliable and economical
2. No alarm
3. No need for complicated infusion pump
4. Easy to use , reduces the training cost
5. Minimize multiple nursing visits
6. Wide selection of volume and flow rate

Applications

Designed for a continuous intra venous and subcutaneous and epidural infusion of drugs for use in

1. Post operative pain relief
2. Chemotherapy
3. Patient controlled analgesia

Features

Unique flat capillaries assures a steady flow rate

Flat capillary has a wide internal diameter and greater length than capillaries of similar devices.

Minimizes risk of capillary obstruction and improves stability and precision of infusion

Balloon is very stable producing a linear infusion profile which minimises dosage peaks

Capacity

65 ml

150 ml

250 ml

Flow rate

2ml / hour

4ml /hour

5ml/ hour

10ml / hour

REVIEW OF LITERATURE

Fernandes et al have done a study to compare the analgesic efficacy and degree of motor blockade achieved with epidural infusion of 0.625 % Bupivacaine (group B) Vs 0.1 % Ropivacaine (Group R) both with Fentanyl 2 μg /ml in labouring patients.

A prospective double blind study was performed in 98 ASA physical status I – II parturient who were divided randomly in to 2 group to receive either Bupivacaine and Ropivacaine after catheter location has been tested with an initial bolus of lidocaine and fentanyl . Infusion rate was 15 ml/ hour in every case. When pain was perceived, 5 ml bolus of assigned epidural analgesics were administered every 10 min until analgesia was achieved.

They recorded pain intensity, level of sensory block, degree of motor block, haemodynamic variables, secondary effects, mode of delivery, neonatal out come, patient satisfaction. There were no statistically significant difference in any of the factors analysed. Highly effective analgesia was achieved in both groups with a small incidence of motor block. These finding suggested that bupivacaine may be more potent than ropivacaine.

Hudgson PS, Liu SS have done a study, A comparison of ropivacaine to bupivacaine with fentanyl for post operative patient controlled epidural analgesia.

Fourty patients undergoing abdominal surgery were randomized in a double blinded manner to the following : 0.05 % bupivacaine / 4 microgram fentanyl , 0.1 % bupivacaine/fentanyl, 0.05 % ropivacaine / fentanyl or 0.1 % ropivacaine/ fentanyl for standardized PCEA. They measured pain scores , side effects, and PCEA consumption for 42 h. Lower extremity motor function was assessed.

Analgesia was equivalent among groups. Local anaesthetic use was more in the 0.1 % bupivacaine and 0.1% ropivacaine groups. Motor function decreased during PCEA and was equivalent among groups. Eight patients were transiently unable to ambulate. These patients used more local anaesthetic with additional decrease in motor function compared with ambulating patients. Other side effects were mild and equivalent among solutions.

Scott DA et al have done a study on post operative analgesia using epidural infusion of fentanyl with bupivacaine – A prospective analysis of 1014 patients.

They observed that post operative epidural fentanyl / bupivacaine infusions are effective and can be managed readily in general wards with minimal complications provided that appropriate observation are performed.

Cooper DW, Turner G have done a study on patient controlled extradural analgesia to compare bupivacaine , fentanyl, bupivacaine with fentanyl in the treatment of post operative pain.

They have assessed the effect of combining extradural bupicacine and fentanyl in 60 orthopedic patients who received 0.125 % bupivacaine fentanyl 5 microgram/ml or 0.125 % bupivacaine with fentanyl 5 micro gram /ml, delivered by patient controlled extradural analgesia for 24 h via lumbar extradural catheter.

They observed that adding bupivacaine to fentanyl reduced mean bupivacaine administration from 113 ml to 89 ml. There was no significant difference between the groups in pain , nausea , motor block, pruritis, sedation. No patients had a ventilatory frequency less than 10 per min. Hypotension occurred in two of 20 patients in the fentanyl group, compared with eight of 19 in the bupivacaine group and ten of 21 in the combined group.

They concluded that extradural bupivacaine and fentanyl were additive in their analgesic actions , resulting in decreased requirements of each individual agents.

Zaric D, Nydahl PA et al, have done a study to investigate the dose response of sensory and motor block during continuous epidural infusion of 0.1%,0.2% or 0.3 % ropivacaine in volunteers in a double blinded manner. Bupivacaine 0.25 % and isotonic saline were used as reference and control respectively.

Each treatment group consisted of eight healthy men. After a bolus dose of 10 ml at the L2-L3 interspace, solution in question was infused at 10 ml/hr for 21 hours. Sensory block was evaluated by pin prick, light touch and thermotest methods. Motor block was measured by the bromage scale. Mobilization of the subjects was attempted through out the investigation.

The number of blocked dermatomes with 0.1 % ropivacaine was significantly smaller than with the other test solutions. Motor block was minimal with 0.1% ropivacaine. It was moderate with 0.2 and 0.3 % ropivacaine and most intense with 0.25 % bupivacaine. The regression phase was significantly shorter with all three concentration of ropivacaine than with bupivacaine.

They concluded that ropivacaine 0.1 % produced limited analgesia and minimal motor block and ambulation was possible throughout the investigation. With 0.2% and 0.3 % ropivacaine, analgesia was more extensive and motor block was considered moderate.

David A Sidebottom, Kevin Russel et al have done a retrospective study to assess the clinical efficacy of addition of low concentration of fentanyl to bupivacaine 0.125 % which infused epidurally for postoperative analgesia.

Three patient group received bupivacaine 0.125 % alone (n70), bupivacaine 0.125 % with 1 ug/ml fentanyl (n 109), bupivacaine 0.125 % with fentanyl (n 70).

The percentage of patients with adequate analgesia – pain score < 3, was higher in both fentanyl groups compared to the plain bupivacaine with the p value <0.05.

Those receiving plain bupivacaine had a greater incidence of patchy blocks compared to both fentanyl group – p value <0.01.

The higher dose of fentanyl was associated with greatly increased length of stable analgesia – p value <0.01.

Patient satisfaction score were higher in the 2ug /ml fentanyl group and lowest in the plain with significant difference between all groups – p value <0.01

The incidence of nausea was higher in the plain bupivacaine group compared to both fentanyl group – p <0.001.

Other side effects were similar between the group.

The study conclude that the addition of fentanyl 1-2 ug /ml to bupivacaine 0.125 % for continuous epidural infusion significantly improved all indicators of analgesia with out and attendant increase in side effects .

MATERIALS AND METHODS

After approval of the study by our institutional ethics committee, the study was conducted on 50 patients of either sex aged between 30- 60 years with American society of Anaesthesia physical status grade I who were undergoing upper and middle abdominal surgery. Age of the patients ranged from 20 – 60years and weight between 40-70 kg and height ranging from 150 – 180 cm. All patients were thoroughly examined preoperatively. Informed consent was obtained from all of them.

In the assessment room , vital parameters like pulse , blood pressure and base line investigations like haemoglobin, urine analysis for albumin and sugar , blood sugar, urea and creatinine and chest X ray PA view , ECG were checked. Thorough examination of the all the systems and airway assessment was done.

Exclusion criteria including significant co – existing diseases, long term analgesic use, and contraindication to regional anaesthesia such as local infection and bleeding diathesis.

PATIENTS WERE RANDOMLY ALLOTTED TO 2 GROUPS CONTAINING 25 EACH.

GROUP BF

Patients received

60 ml of 0.5 % Bupivacaine +

10 ml of Fentanyl (100µg)+

180 ml of Normal saline

in 250 ml of infusion pump

GROUP RF

Patients received

60 ml of 0.5 % Ropivacaine +

10 ml of Fentanyl (100 µg) +

180 ml of Normal Saline

in 250 ml of infusion pump.

Epidural infusion pump used in this study was DOSIFUSER portable, elastomeric pump with the capacity of 250 ml with the fixed infusion rate of 5.2 ml /hr.

Concentration of anaesthetic mixture used in this study

Group BF –

Concentration – Bupivacaine – 0.125%

Fentanyl – 2 μg/ml

Group RF –

Concentration – Ropivacaine – 0.125 %

Fentanyl – 2 μg/ml

Anaesthetic management :

In the operating theatre the Boyles apparatus , emergency drugs and airway devices were kept ready. Patients were shifted to operating table. NIBP, ECG , Pulse oximetry were connected to the patients. Preoperative baseline systolic and diastolic blood pressure , Pulse rate, oxygen saturation were recorded. Patients were cannulated with 18 g IV cannula and IV fluid RL started. The patients were placed in right lateral position. The skin over the back was prepared with antiseptic solution and draped with sterile towel. After infiltrating skin and subcutaneous tissue with local anaesthetic , 17 G Tuohy needle inserted either in T12 –L1 or L1-L2 or L2-L3 space according to nature of the surgery . Epidural space was located with loss resistance to air and 19 Gauge epidural catheters inserted and placed at depth of 5 cm after giving test dose of 3 ml of 2 % lignocaine with 1:200000 dilution of adrenaline,

All patients in both group received General anaesthesia as intraoperative anaesthesia .General anaesthetic technique was similar in both the groups.

Intraoperatively all patients were managed depending upon the patients preoperative status and type of the surgery. IV fluids & blood transfusions were given according to haemodynamic monitoring and blood loss.

30 min before the end of the surgery epidural infusion was started, and time was noted .

At the end of surgery neuro muscular blockade was antagonised and tracheal extubation was done provided the patients were conscious, haemodynamically stable and maintained adequate ventilation.

All the patients were shifted to post operative surgical ward. Each patient's post operative course was followed for the 48 hours since activation of continuous epidural infusion.

Patients pulse rate, blood pressure. Respiratory rate, SpO2, Pain score using Visual Analogue Scale , Sedation score using Ramsay scale, Motor block using bromage scale and any complications were noted every 8 hourly.

Break through pain was managed with Inj Tramadol 50 mg IV.

After 48 hours infusion pumps were stopped and epidural catheter was removed

PARAMETERS OBSERVED

1. POST OPERATIVE PULSE RATE
2. POST OPERATIVE SYSTOLIC AND DIASTOLIC BLOOD PRESSURE
3. RESPIRATORY RATE
4. SPO2
5. PAIN SCORE
6. SEDATION SCORE
7. BREAK THROUGH PAIN AND ADJUVANTS USED
8. ANY COMPLICATION – LIKE NAUSEA , VOMITTING, PRURITIS

VISUAL ANALOGUE SCALE

Used to assess the severity of pain.

0- No pain

1-

2- Mild pain

3-

4- Moderate pain

5-

6- Severe pain

7-

8- Very severe pain

9-

10- Worst possible pain

RAMSAY SEDATION SCORE

1. Patient anxious and agitated or restless of both
2. Patient cooperative, oriented, and tranquil
3. Patient responds to commands only
4. Brisk responds to commands only
5. Sluggish response to light glabellar tap or auditory stimulus
6. No response to stimuli mentioned in items 4 and 5

OBSERVATION AND RESULTS

OBSERVATIONS AND ANALYSIS

The informations collected regarding all the selected cases were recorded in a Master chart. Data analysis was done with the help of epidemiological information package (2008)

Using this software range , frequencies, percentages , means , standard deviations , p values were calculated. '*P value*' was calculated using students t test. A " *p*" value of less than 0.05 is taken to denote significant results.

OBSERVATION AND RESULTS

This study comprised two groups.

The patients in *group BF* received 0.5 % Bupivacaine 60 ml + 10 ml Fentanyl (100 μg) +180 ml Normal Saline.

In *group RF* received 60 ml of 0.5 %Ropivacaine + 10 ml Fentanyl + 180 ml Normal Saline

DEMOGRAPHIC DATA

1. AGE

Age distribution in the group BF varied from 26 years to 60 years with mean age of 43 years and standard deviation of 13 .

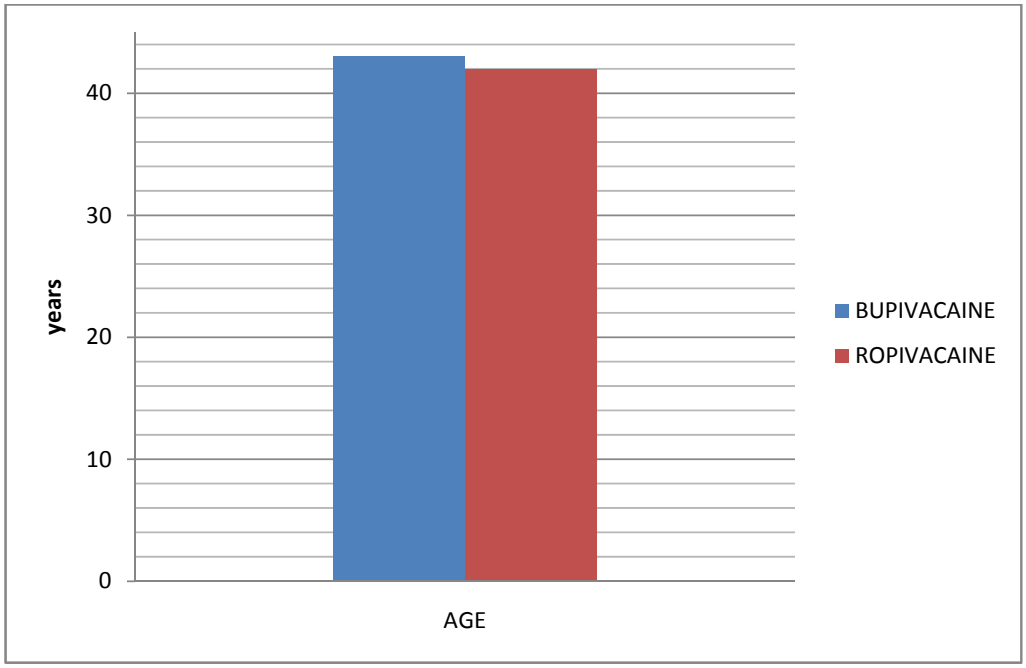
In group RF age varied from 25 years to 60 years with mean value of 42 years and standard deviation of 10 .

2 . HEIGHT

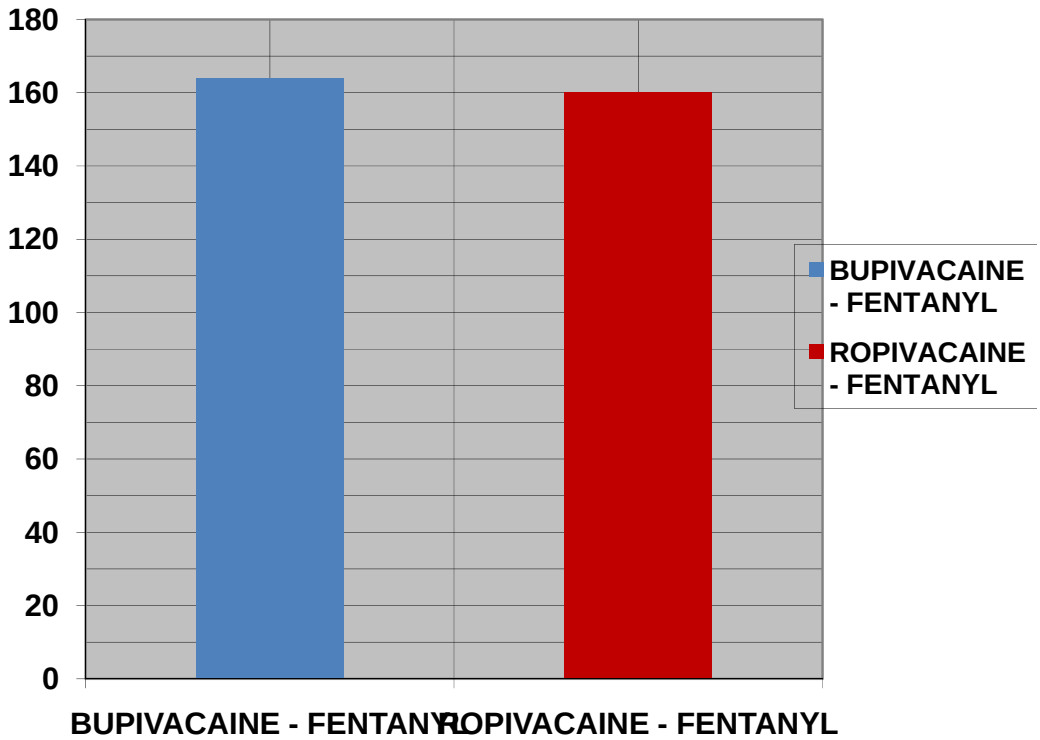
Height of the patients in the group BF had a mean value of 164 cm with the standard deviation of 6 .

In group RF had a mean value of 160 cm with standard deviation of 6.4 .

AGE


40
30
20
10
0
years
AGE
BUPIVACAINE
ROPIVACAINE

HEIGHT


180
160
140
120
100
80
60
40
20
0
BUPIVACAINE - FENTANYL
ROPIVACAINE - FENTANYL
BUPIVACAINE - FENTANYL
ROPIVACAINE - FENTANYL

3. WEIGHT

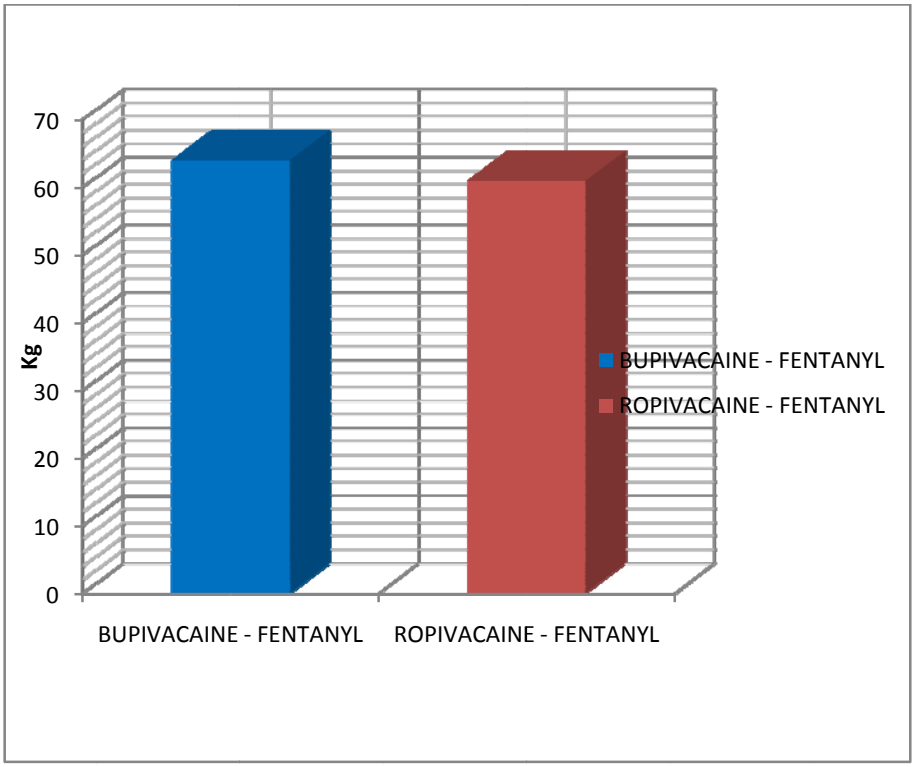
Weight of the patients in the group BF had a mean value of 64.7kgs with standard deviation of 5.

In group RF had mean value of 61.28 kgs with standard deviation of 7.

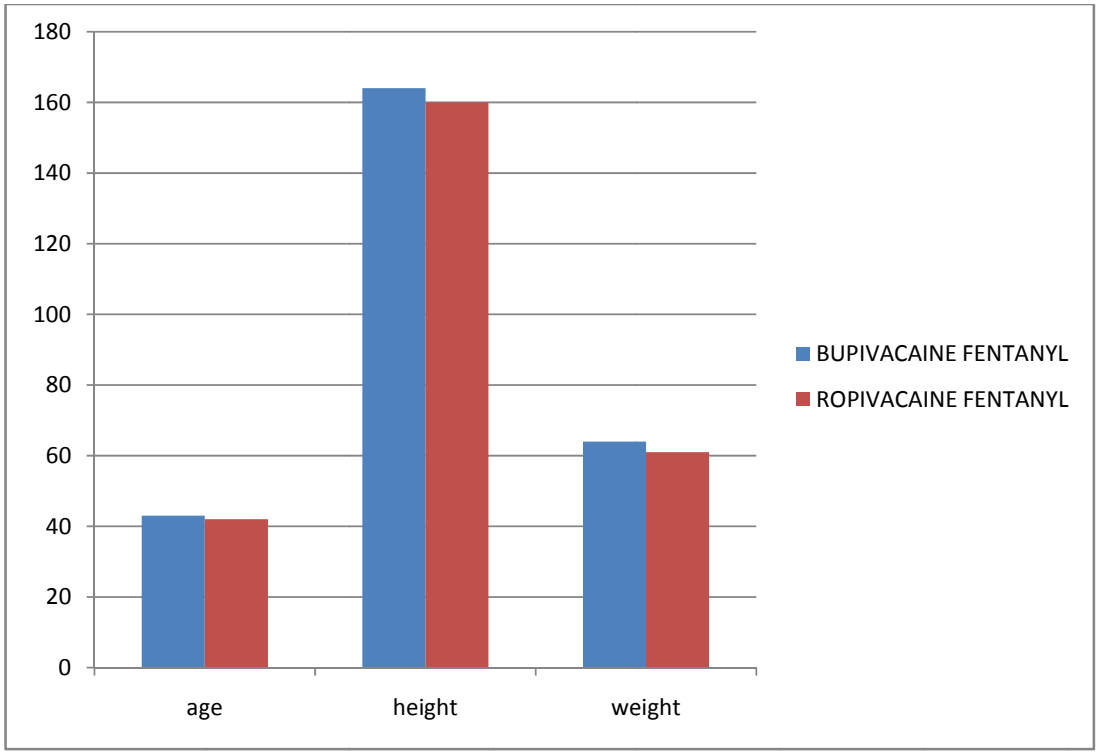
DEMOGRAPHIC DATA

FACTORS	**BUPIVACANIE-FENTANYL**	**ROPIVACAINE - FENTANYL**
AGE	43 ± 13	42 ± 10
HEIGHT	164 ± 6	160 ± 6.4
WEIGHT	64.7 ± 5	61.28 ± 7

WEIGHT



DEMOGRAPHIC DATA

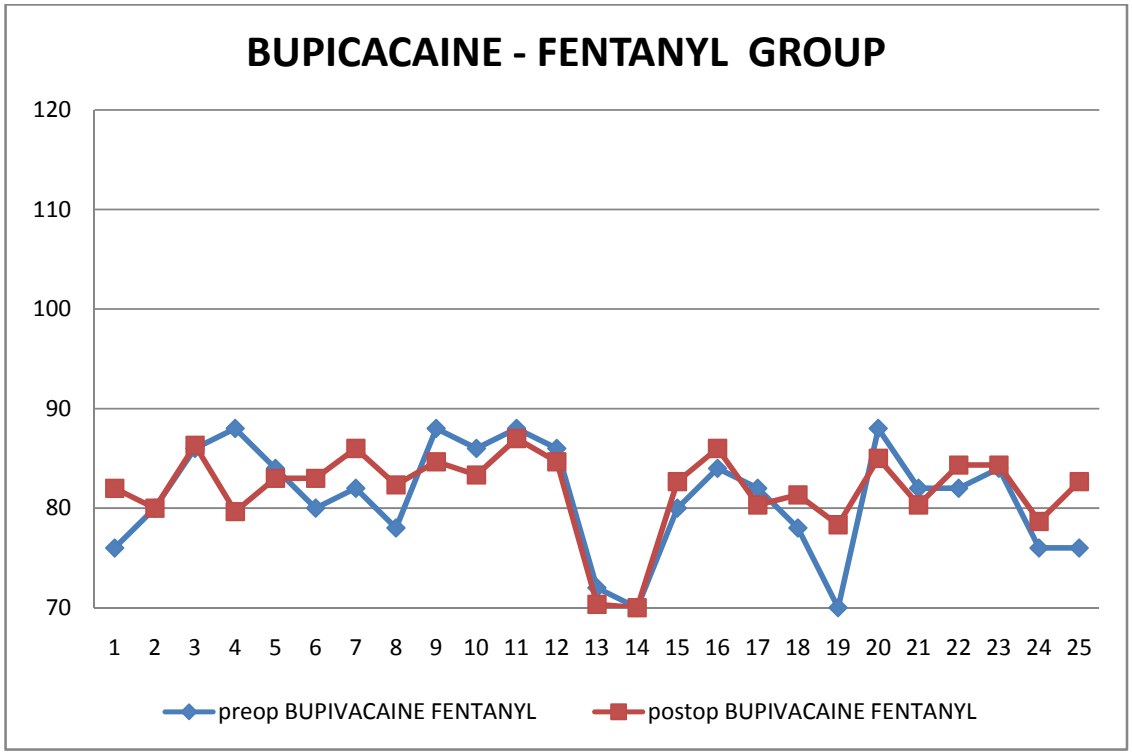


4. **PULSE RATE**

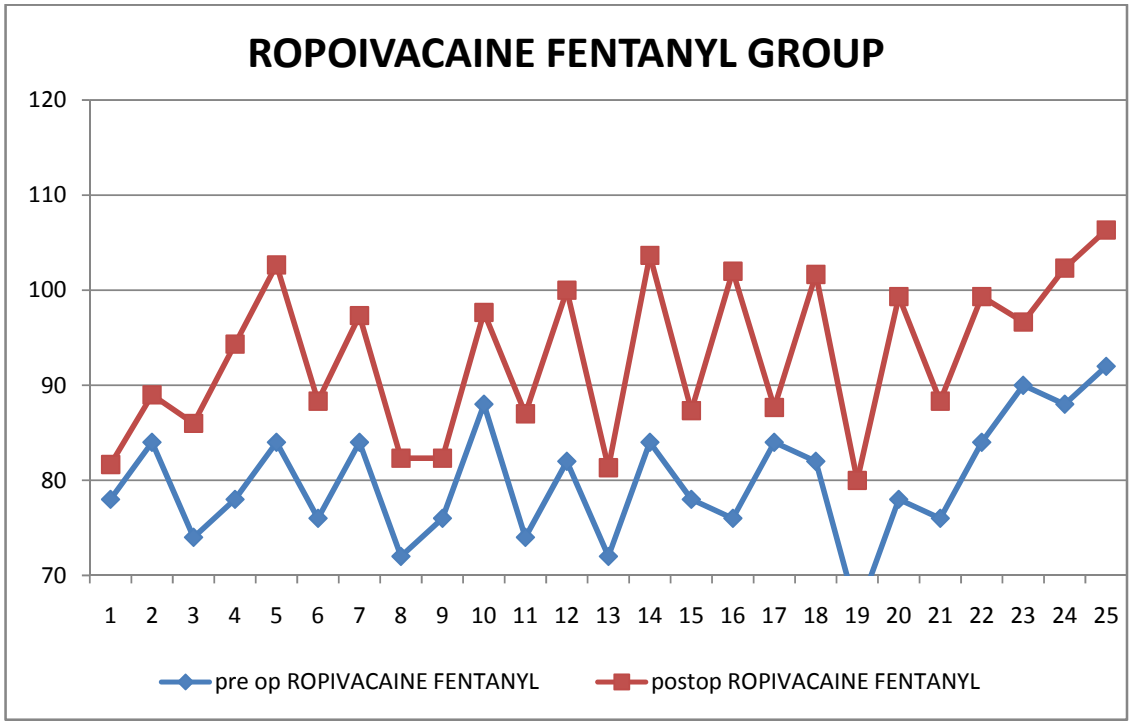
In the BF group mean preoperative pulse rate was 81with standard deviation of 5. The post operative mean pulse rate was 81 with standard deviation of 4.25 . The p value between two was 0.54, that was not statistically significant.

In the RF group mean preoperative pulse rate was 80 with standard deviation of 6.29. The mean post operative pulse rate was 92.9 with standard deviation of 8.36. The p value between two was < 0.0001,that was statistically significant

PULSE RATE



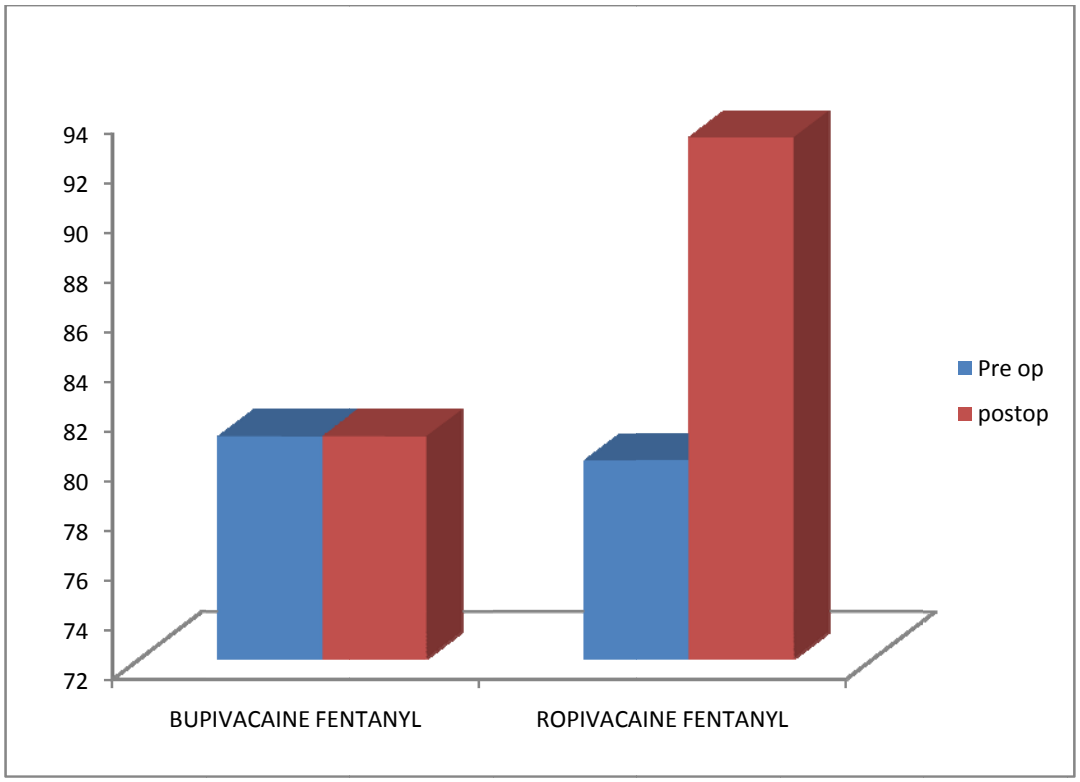
PULSE RATE



PULSE RATE

GROUP	PRE OPERATIVE	POST OPERATIVE	P VALUE
BUPIVACINE – FENTANYL	81 ± 5	81 ± 4.2	0.54
ROPIVACAINE – FENTANYL	80 ±6.29	92.9 ± 8.36	< 0.0001

PULSE RATE

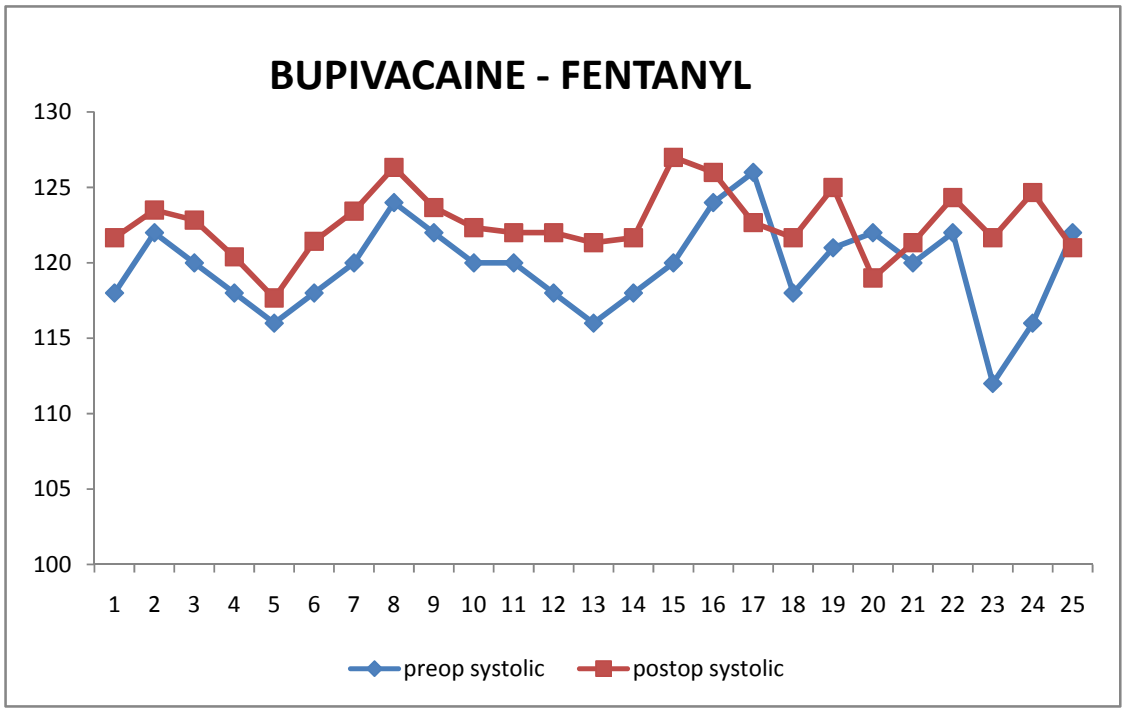


5. **BLOOD PRESSURE – SYSTOLIC**

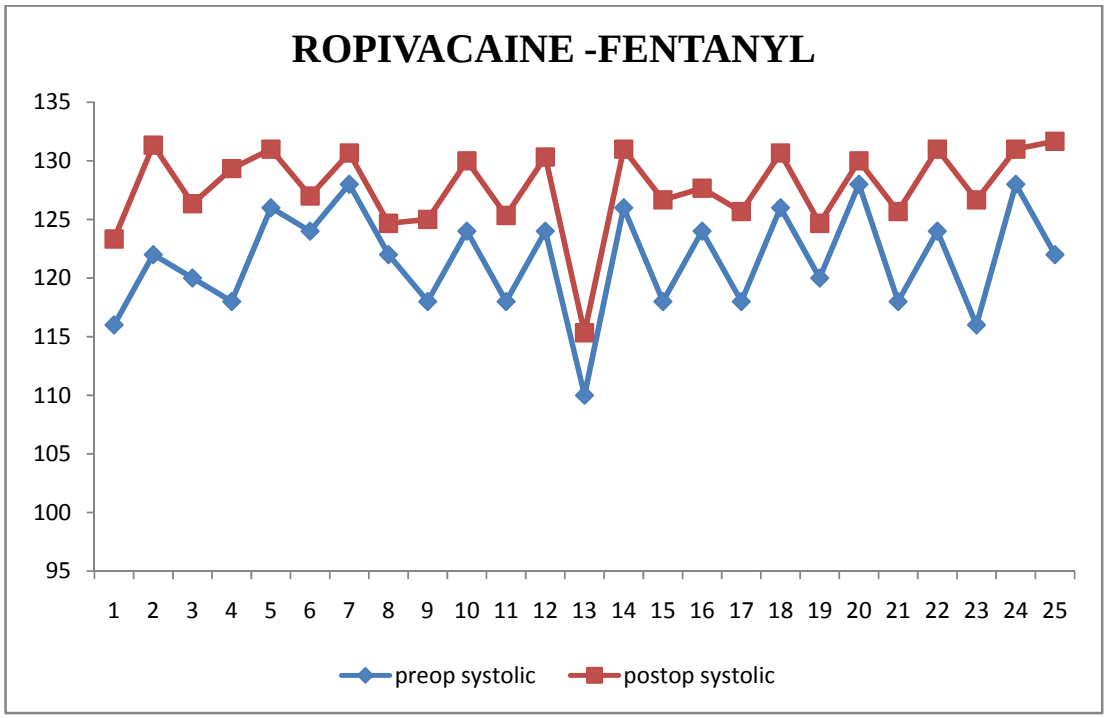
In BF group mean preoperative systolic BP was 121 with standard deviation of 3.04. The mean post operative systolic BP was 123 with standard deviation of 4.24. The p value between two was 0.484 that not significant.

In the RF group the mean preoperative systolic BP was 121.52 with standard deviation of 4.51. The mean post operative systolic BP was 127.68 with standard deviation of 3.68. The p value < 0.0001 was statistically significant.

BLOOD PRESSURE – SYSTOLIC



BLOOD PRESSURE – SYSTOLIC

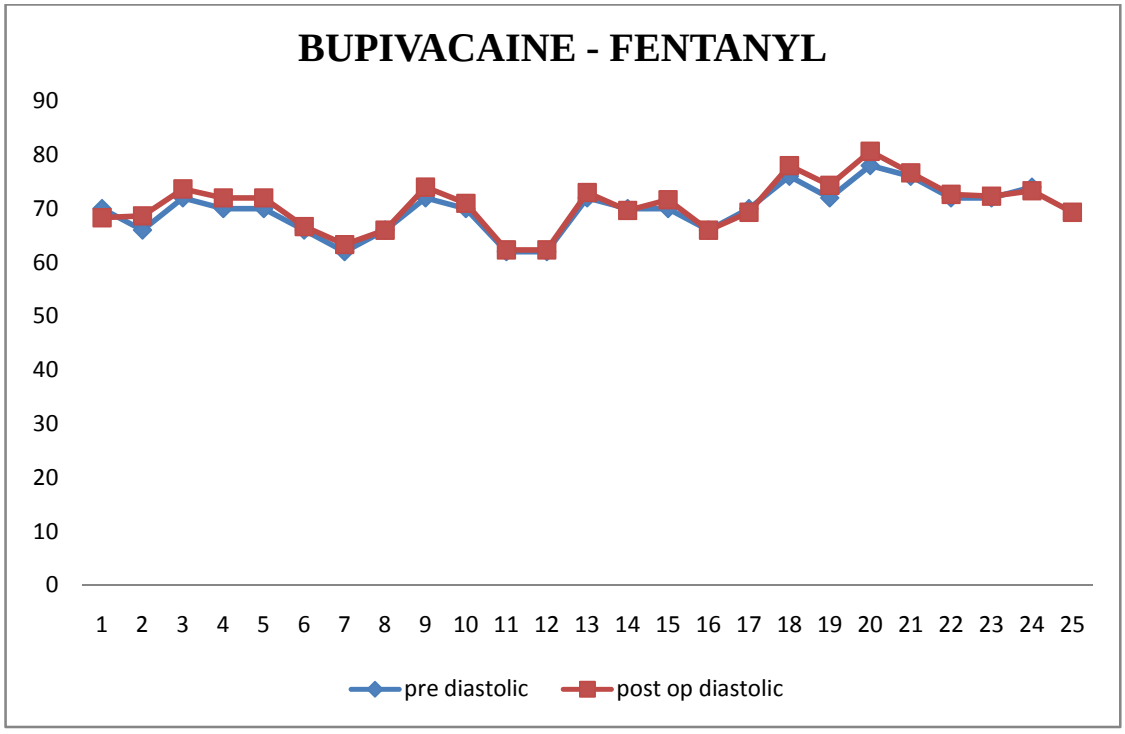


6. **DIASTOLIC BLOOD PRESSURE**

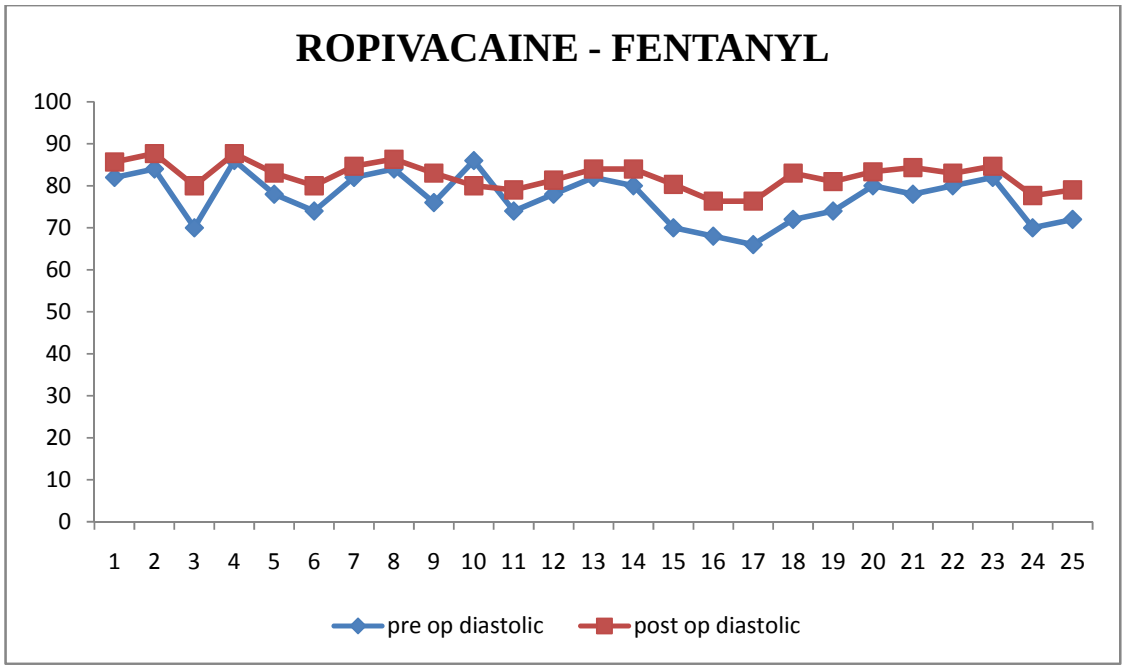
In the BF group mean preoperative diastolic BP was 70 with standard deviation of 4.24. The mean post operative diastolic BP was 71 with standard deviation of 4.62 . The p value is 0.429 that is not significant

In the RF group the mean preoperative diastolic blood pressure was 77.012 with standard deviation of 5.83. The mean post operative diastolic BP was 82.21 with standard deviation of 3.20. The p value 0.0004 which was highly significant.

DIASTOLIC BLOOD PRESSURE

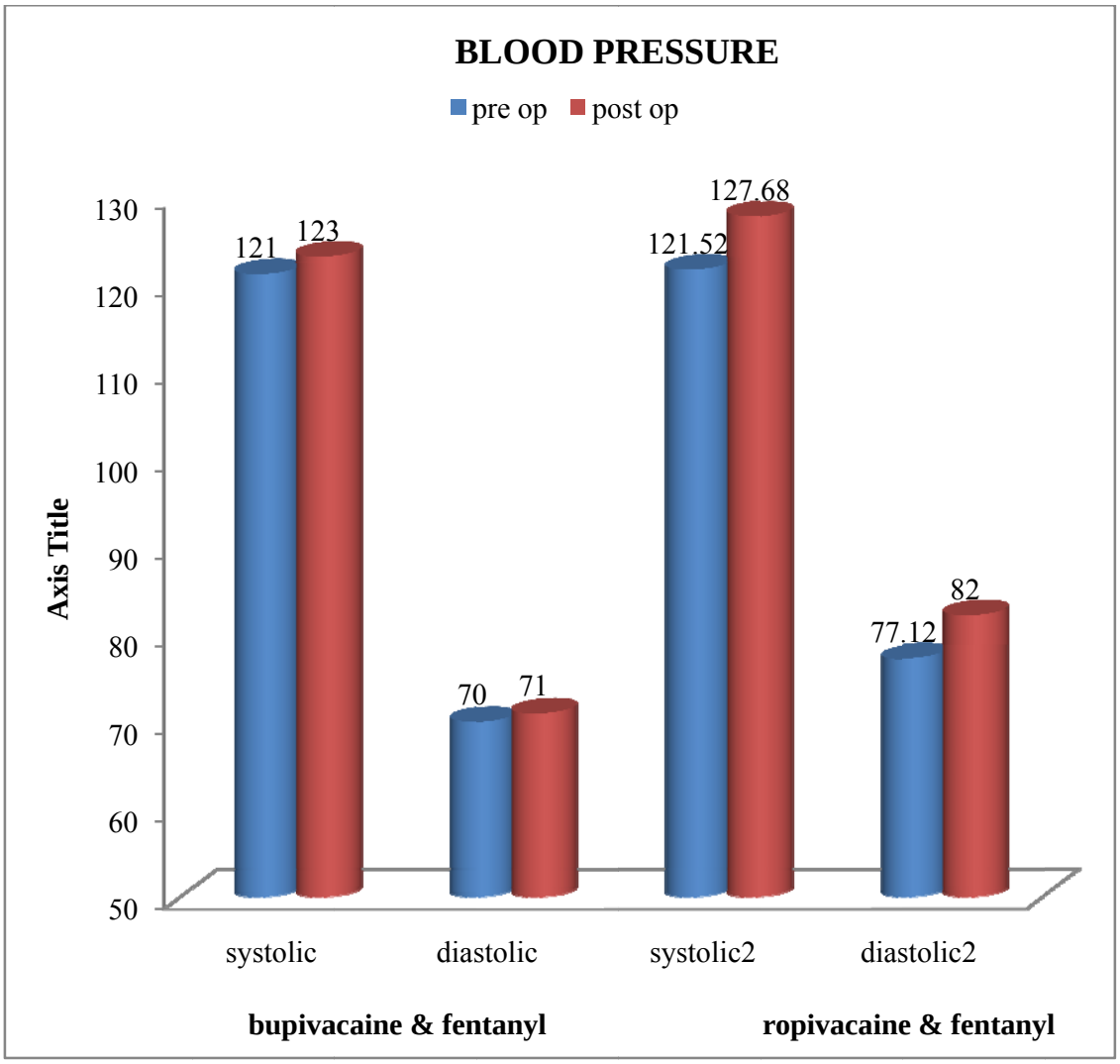


DIASTOLIC BLOOD PRESSURE



BLOOD PRESSURE:

	BUPIVACAINE		**ROPIVACAINE**	
	SYSTOLIC	DIASTOLIC	SYSTOLIC	DIASTOLIC
PRE OP	121 ± 3.04	70 ± 4.24	121.52 ± 4.51	77.1 ± 5.83
POST OP	123 ± 2.18	71 ± 4.62	127.68 ± 3.68	82.21 ± 3.20
P value	0.484	0.429	<0.0001	<0.0004


BLOOD PRESSURE
pre op
post op
Axis Title
130
120
110
100
90
80
70
60
50
121
123
70
71
121.52
127.68
77.12
82
systolic
diastolic
systolic2
diastolic2
bupivacaine & fentanyl
ropivacaine & fentanyl

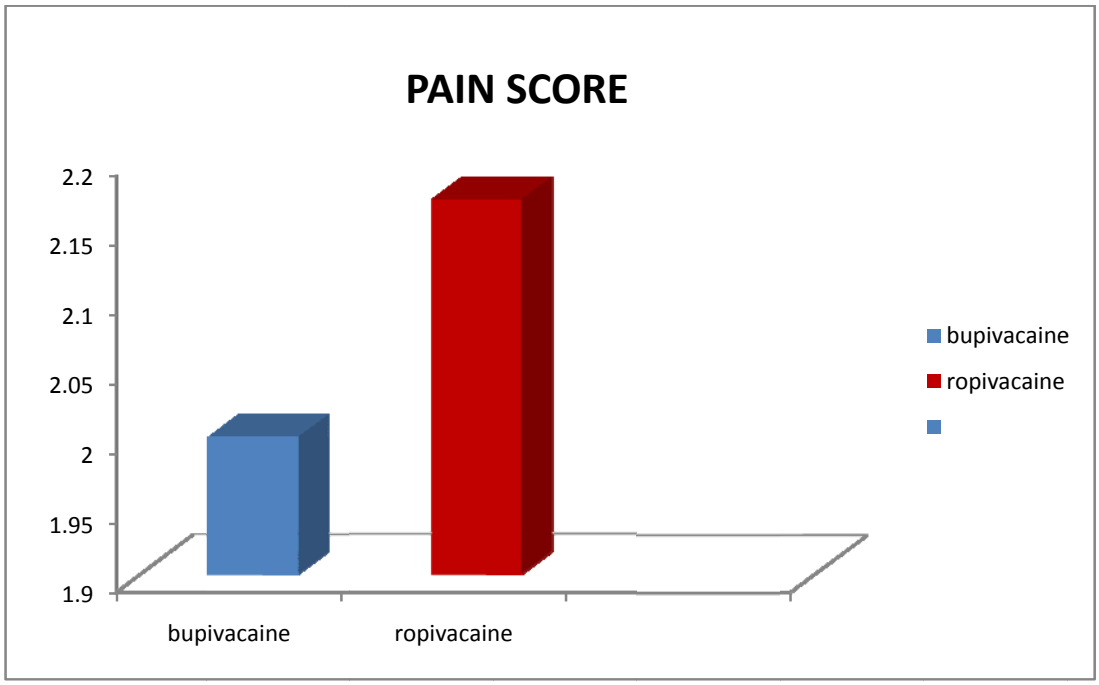
PAIN SCORE

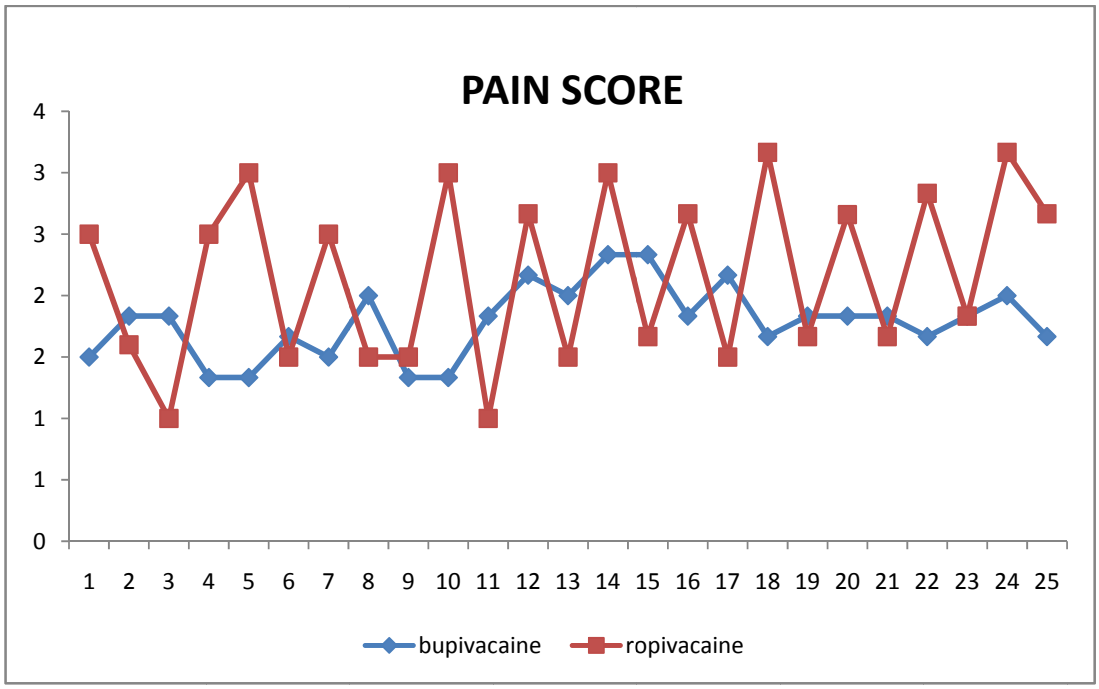
The mean pain score in the BF group was 2 with standard deviation of 0.29.

In the RF group the mean pain score was 2.17 with standard deviation of 0.706.

The p value between two was 0.0204 that was statistically significant.

GROUP	PAIN SCORE
BUPIVACAINE - FENTANYL	2 ± 0.29
ROPIVACAINE- FENTANYL	2.17± 0.706
P value	0.0204


PAIN SCORE
2.2
2.15
2.1
2.05
2
1.95
1.9
bupivacaine
ropivacaine
bupivacaine
ropivacaine

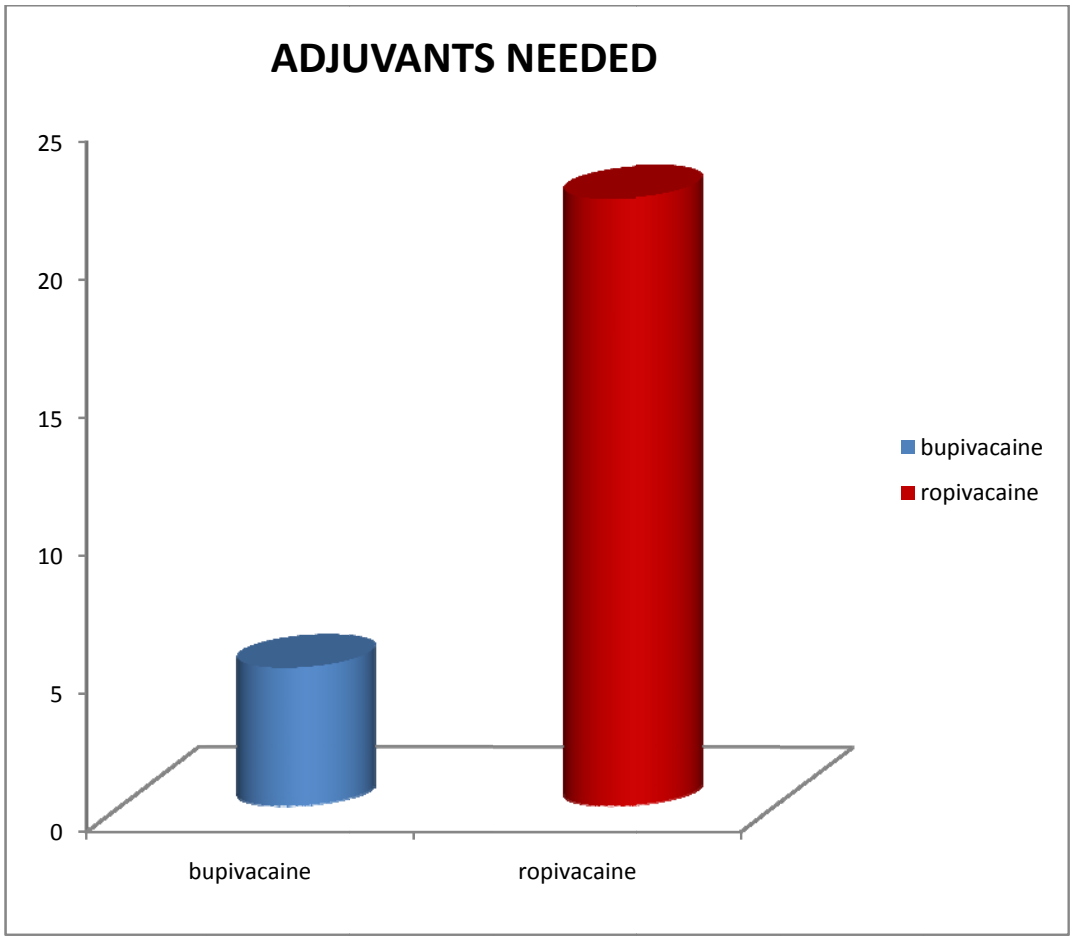

PAIN SCORE
4
3
3
2
2
1
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
bupivacaine
ropivacaine

ADJUVANTS NEEDED :

BF group needed 6 times of rescue analgesia

RF group needed 22 times of rescue analgesia

GROUP	NO OF TIMES ADJUVANT
BUPIVACAINE FENTANYL	6
ROPIVACAINE-FENTANYL	22


ADJUVANTS NEEDED
25
20
15
10
5
0
bupivacaine
ropivacaine
bupivacaine
ropivacaine

DISCUSSION

Portable , elastomeric epidural infusion pumps is an economical and more reliable mode of delivering the drugs. It was available in various volume, and variable flow rates.It provides continuous delivery of drug according to the flow rate for fixed hours.

For continuous epidural analgesia local anaesthetics with opioids combination were commonly used.

Bupivacaine, Ropivacaine, levobupivacaine are the commonly used local anaesthetics, because of their differential blockade of sensory fibres rather than motor fibres.

Local anaesthetics are used in the concentration of <0.125 to 0.2 %

Opioids commonly used are Fentanyl, Sufentanil, morphine , hydromorphine .

Local anaesthetic and opioid combination in epidural infusion provides superior post operative analgesia, decreases the dose of local anaesthetic and reduces the side effects.

By statistical analysis of two groups the age distribution in both groups was statistically not significant with a p value of 0.8

When comparing the weight of the patient in two groups it was statistically not significant with p value 0.78

There was no statistically significant differences between the two groups as regards to sex distribution 0.89.

Pre and post operative pulse rate ;

Mean preoperative pulse rate in BF group was 81 ±5 and post operative pulse rate was 81 ±4.25 . The difference between two was statistically not significant (p> 0.54)

Mean preoperative pulse rate in RF group was 80 ± 6.29 and post operative pulse rate was 92.9 ± 8.36. The difference between two was statistically significant (p < 0.0001)

Blood pressure – systolic

Mean preoperative systolic BP in BF group was 121 ± 3.04 , and mean post operative blood pressure was 123 ± 2.18 . The difference between two was statistically not significant (p 0.484)

Mean preoperative systolic BP in RF group was 121.54± 4.51 , and mean post operative systolic BP was 127.68 ± 3.68 . The difference between two was statistically significant with p value of < 0.0001.

Blood pressure – diastolic

Mean diastolic BP in BF group was 70 ±4.24 and mean post operative diastolic BP was 71 ± 4.62 . The difference between two was statistically not significant with a p value 0.429

Mean diastolic BP in RF group was 77.12 ± 5.83 and mean post operative diastolic BP was 82.21 ± 3.20 . The difference between two was statistically significant with p value < 0.0004

Post operative pain score

Mean post operative pain score in the BF group was 2 ± 0.29 and in RF group it was 2.17 ± 0.706 . The difference between two was statistically significant with p value of 0.0204.

Number of time adjuvants needed

Adjuvants are needed 6 times in BF group.

In RF group adjuvants was used in 22 times.

Post operative sedation score was equal in both groups.

Post operative respiratory rate and Sp02 was equal in both group.

No significant complication between two groups.

SUMMARY

50 patients of ASA grade I who underwent upper and middle abdominal surgeries were randomly assigned into two groups, Group BF and Group RF.

Surgery was done under general anaesthesia. Thirty minutes before the end of the surgery continuous epidural infusion was started with portable elastomeric infusion pump having the flow rate of 5.2 ml / hr

The patients in group BF received 60 ml of 0.5 % Bupivacaine and 10 ml of Fentanyl(100µg) and 180 ml of Normal saline

In group RF patients received 60 ml of 0.5 % Ropivacaine and 10 ml of Fentanyl(100µg) and 180 ml Normal saline.

Parameters observed every eight hours after start of infusion pump were , post operate pulse rate, systolic and diastolic blood pressure , respiratory rate, spo2, Pain score, sedation score, no of time adjuvant drug used and side effects.

This study with continuous epidural infusion by single use infusion pump for 48 hours shows that

1. Bupivacaine with fentanyl provide superior postoperative pain relief compared With Ropivacaine with Fentanyl.

2. Bupivacaine with Fentanyl maintains stable heamodynamic of post operative pain relief compared with Ropivacaine with Fentanyl

CONCLUSION

By using portable, elastomeric epidural infusion pump for the purpose of post operative analgesia by continuous epidural infusion of Bupivacaine with Fentanyl provides superior analgesia compared to Ropivacaine with Fentanyl.

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CONTINUOUS EPIDURAL INFUSION OF BUPIVACAINE WITH FENTANYL AND ROPIVACINE WITH FENTANYL FOR POST OPERATIVE PAIN RELIEF BY USING PORTABLE, ELASTOMERIC INFUSION PUMP

Name : Age : Sex : Date :

Height : Weight :

Ward : IP No :

Diagnosis : Surgery :

ASA Grade :

Catheter insertion site : Depth of catheter :

Infusion mixture : Infusion rate :

Intra operative anaesthesia :

Infusion starting time :

Complications :

Infusion termination time :

PRE OPERATIVE

TIME	PULSE RATE	BP	Sp02	RESPIRATORY RATE

POST OPERATIVE

TIME IN HR	PR	BP	SPO2	RR	SEDATION SCORE	PAIN SCORE	MOTOR BLOCK	ADJUVANT DRUGS

BUPIVACAINE FENTANYL GROUP

NAME	AGE	SEX	PREOP DIA BP	POST OP DIAST	2	3	4	5	6	AVERAGE	SPO2	RR
Pannerse	48	m	70	72	68	64	70	62	74	68	98	18
Veerama	48	m	66	62	68	66	72	74	70	68.66666667	98	18
Perumal	55	m	72	74	72	78	64	80	74	73.66666667	99	20
Thiagara	47	m	70	78	76	74	68	70	66	72	98	22
Kanman	30	f	70	72	78	72	68	64	66	72	99	20
Latha	28	f	66	64	68	66	70	64	68	66.66666667	98	18
Pandarin	52	m	62	68	66	60	62	60	64	63.33333333	99	20
Veerama	48	M	66	64	68	64	66	70	64	66	98	18
Ramasar	60	m	72	70	78	74	76	74	72	74	98	16
Ragavall	48	f	70	72	70	68	70	74	72	71	99	18
periyana	55	f	62	62	60	62	64	62	64	62.33333333	97	18
Mala	21	f	62	62	64	62	60	62	64	62.33333333	99	20
Radha	60	f	72	72	68	70	74	76	78	73	99	22
Saraswa	53	f	70	72	74	68	66	68	70	69.66666667	98	18
Vetriselv	35	f	70	66	68	64	80	78	74	71.66666667	99	18
Mookay	50	f	66	66	64	68	70	64	64	66	97	16
Saraswa	53	f	70	68	64	68	72	74	70	69.33333333	98	22
Radha	60	f	76	70	74	84	78	76	86	78	99	20
lakshmi	42	f	72	72	76	74	78	72	74	74.33333333	98	18
Selvi	27	f	78	80	82	86	78	74	84	80.66666667	99	16
Ramaye	48	f	76	78	76	74	80	78	74	76.66666667	97	18
Prabhaka	16	m	72	68	70	72	74	70	82	72.66666667	98	20
Philip	49	m	72	78	74	76	72	68	66	72.33333333	99	20
Rajeswa	25	f	74	72	74	76	74	70	74	73.33333333	98	18
Parames	28	f	70	68	64	66	70	72	76	69.33333333	98	18
	43.44		70							71		
	13.125		4.239497							4.625733175		

BUPIVACAINE FENTANYL GROUP

NAME	AGE	SEX	HEIGHT	WEIGHT	PREOP SYS BP	POST OP BP	2	3	4	5	6	POST OP SYST
Pannerselvam	48	m	168	68	118	120	122	126	120	118	124	122
Veeramalai	48	m	170	72	122	118	120	116	124	128	126	123.5
Perumal	55	m	168	66	120	123	126	118	122	128	120	122.8333
Thiagarajan	47	m	174	72	118	124	122	116	118	126	114	120.4
Kanmani	30	f	164	68	116	112	120	126	114	118	116	117.6667
Latha	28	f	168	65	118	118	124	128	116	112	126	121.4286
Pandarinathan	52	m	170	72	120	124	128	126	114	126	112	123.4286
Veeramalai	48	M	162	50	124	130	128	134	126	122	118	126.3333
Ramasamy	60	m	168	68	122	124	132	118	116	122	130	123.6667
Ragavalli	48	f	158	56	120	128	114	124	118	126	124	122.3333
periyanayaki	55	f	160	68	120	126	118	116	120	124	128	122
Mala	21	f	162	64	118	118	124	122	126	116	126	122
Radha	60	f	168	67	116	124	128	118	120	114	124	121.3333
Saraswathy	53	f	166	68	118	114	118	120	126	128	124	121.6667
Vetriselvi	35	f	164	64	120	130	132	122	124	128	126	127
Mookayee	50	f	156	66	124	128	126	134	118	124	126	126
Saraswathy	53	f	154	64	126	118	114	124	126	130	124	122.6667
Radha	60	f	158	66	118	128	124	118	130	116	114	121.6667
lakshmi	42	f	162	68	121	122	126	120	124	132	126	125
Selvi	27	f	168	54	122	118	116	122	124	114	120	119
Ramayee	48	f	156	58	120	114	124	118	126	120	126	121.3333
Prabhakar	16	m	166	59	122	126	128	118	122	128	124	124.3333
Philip	49	m	174	68	112	124	122	108	126	128	122	121.6667
Rajeswari	25	f	168	66	116	124	118	126	132	120	128	124.6667
Parameswari	28	f	158	62	122	122	126	124	118	116	120	121
	43.44		164.4	64.76	119.72							123
	13.125		160.88	5.554878	3.0484969							2.180733

BUPIVACAINE FENTANYL GROUP

NAME	AGE	SEX	HEIGHT	WEIGHT	PRE OP PR	POSTOP PR	2	3	4	5	6	AVERAGE
Pannerse	48	m	168	68	76	76	78	88	80	84	86	82
Veerama	48	m	170	72	80	76	82	84	78	86	88	80
Perumal	55	m	168	66	86	84	88	86	90	86	84	86.33
Thiagara	47	m	174	72	88	78	74	76	80	84	86	79.66
Kanman	30	f	164	68	84	84	80	86	78	82	88	83
Latha	28	f	168	65	80	76	80	84	88	84	86	83
Pandarin	52	m	170	72	82	84	88	90	82	78	86	86
Veerama	48	M	162	50	78	78	80	82	84	86	84	82.333
Ramasar	60	m	168	68	88	84	86	80	84	86	88	84.667
Ragavall	48	f	158	56	86	82	88	86	80	78	86	83.333
periyana	55	f	160	68	88	86	88	84	88	90	86	87
Mala	21	f	162	64	86	82	78	88	90	86	84	84.667
Radha	60	f	168	67	72	64	68	74	78	72	66	70.333
Saraswat	53	f	166	68	70	68	72	76	70	66	68	70
Vetriselv	35	f	164	64	80	78	84	88	80	82	84	82.667
Mookay	50	f	156	66	84	88	90	84	88	86	80	86
Saraswat	53	f	154	64	82	74	78	86	80	84	80	80.333
Radha	60	f	158	66	78	78	84	86	74	80	86	81.333
lakshmi	42	f	162	68	70	68	72	76	84	84	86	78.333
Selvi	27	f	168	54	88	84	86	88	82	84	86	85
Ramaye	48	f	156	58	82	72	74	82	84	86	84	80.333
Prabhaka	16	m	166	59	82	82	88	86	84	86	80	84.333
Philip	49	m	174	68	84	86	90	84	82	80	84	84.333
Rajeswa	25	f	168	66	76	72	84	78	82	80	76	78.667
Parames	28	f	158	62	76	74	80	84	86	88	84	82.667
	43.44		164.4	64.76	81.04							81.853
	13.125		160.88	5.554878	5.48087584							4.2536

BUPIVACAINE FENTANYL GROUP

NAME	AGE	SEX	SEDATION SCORE	PAIN SCORE	2	3	4	5	6	PAIN SCORE	MOTOR BLOCK	ADJUVANT
Pannerselvar	48	m	2	1	2	1	2	1	2	2	1	0
Veeramalai	48	m	2	2	2	1	2	2	2	1.833333	1	0
Perumal	55	m	2	2	2	2	1	2	2	1.833333	1	0
Thiagarajan	47	m	2	2	2	1	1	1	1	1.333333	1	0
Kanmani	30	f	2	1	1	2	1	2	1	1.3333	1	0
Latha	28	f	2	2	2	2	1	2	1	1.666667	1	0
Pandarinatha	52	m	2	2	2	2	1	1	1	1.5	1	0
Veeramalai	48	M	2	2	2	2	2	2	2	2	1	0
Ramasamy	60	m	2	1	2	1	1	2	1	1.333333	1	0
Ragavalli	48	f	2	1	2	1	1	2	1	1.333333	1	0
periyanayaki	55	f	2	2	2	2	1	2	2	1.833333	1	0
Mala	21	f	2	2	3	2	2	2	2	2.166667	1	0
Radha	60	f	2	2	2	3	1	2	2	2	1	0
Saraswathy	53	f	2	2	3	2	3	2	2	2.333333	1	0
Vetriselvi	35	f	2	2	3	3	2	2	2	2.333333	1	0
Mookayee	50	f	2	1	2	2	2	2	2	1.833333	1	0
Saraswathy	53	f	2	2	2	3	2	2	2	2.166667	1	0
Radha	60	f	2	1	2	2	2	1	2	1.666667	1	0
lakshmi	42	f	2	2	2	2	1	2	2	1.833333	1	0
Selvi	27	f	2	1	2	2	2	2	2	1.833333	1	0
Ramayee	48	f	2	1	2	2	2	2	2	1.833333	1	0
Prabhakar	16	m	2	1	2	2	2	2	1	1.666667	1	0
Philip	49	m	2	2	2	2	2	1	2	1.833333	1	0
Rajeswari	25	f	2	2	2	2	2	2	2	2	1	0
Parameswari	28	f	2	1	2	2	2	2	1	1.666667	1	0
	43.44									2		
	13.125									0.294709		

ROPIVACAINE FENTANYL GROUP

NAME	AGE	SEX	PREOP DIA BP	POST OP DIAST BP	2	3	4	5	6	AVERAGE
Ravikoundan	57	m	82	84	88	90	86	84	82	85.667
Gurulaksmi	40	f	84	88	90	92	86	84	86	87.667
Anusuya	32	f	70	74	76	84	82	80	84	80
Meenakshi	40	f	86	88	90	92	86	86	84	87.667
Dhanalaksmi	40	f	78	80	84	86	88	78	82	83
Mary	55	f	74	78	82	84	86	76	74	80
Vasantha	50	f	82	84	88	86	84	84	82	84.667
periyakkal	58	f	84	86	88	84	90	84	86	86.333
Bagavathi	48	f	76	78	80	86	84	88	82	83
Latha	25	f	86	88	82	78	76	74	82	80
Jamuna	29	f	74	78	80	74	76	84	82	79
Sumathy	37	F	78	80	84	82	78	86	78	81.333
Rani	56	f	82	88	90	82	84	82	78	84
mari regina	35	f	80	84	82	86	84	82	86	84
Santhakumari	40	f	70	82	84	72	78	82	84	80.333
Lakshikanthan	60	m	68	74	70	76	82	72	84	76.333
Uma	32	f	66	72	68	70	82	84	82	76.333
Mookayee	40	f	72	78	80	86	88	84	82	83
Subaiya	60	m	74	78	76	74	84	88	86	81
tamilarasi	40	f	80	88	92	82	78	76	84	83.333
Marimuthu	30	m	78	80	82	88	86	84	86	84.333
vasantha kumari	45	f	80	84	86	82	80	78	88	83
Sakeela	47	f	82	84	86	88	82	88	80	84.667
shanthi	31	f	70	74	76	78	72	82	84	77.667
Karuppaiya	40	m	72	74	78	80	82	76	84	79
	42.68		77.12							82.213
	10.491		5.83324							3.2014

ROPIVACAINE FENTANYL GROUP

NAME	AGE	SEX	HEIGHT	WEIGHT	PREOP SYS BP	POST OP SYSBP	2	3	4	5	6	AVERA
Ravikoundan	57	m	158	65	116	124	126	120	118	124	128	123.33
Gurulaksmi	40	f	152	48	122	126	138	130	140	126	128	131.33
Anusuya	32	f	154	56	120	124	126	130	128	126	124	126.33
Meenakshi	40	f	156	52	118	126	132	134	122	130	132	129.33
Dhanalaksmi	40	f	158	55	126	128	136	124	140	126	132	131
Mary	55	f	156	53	124	126	128	126	130	124	128	127
Vasantha	50	f	158	56	128	130	140	128	138	122	126	130.67
periyakkal	58	f	162	58	122	124	126	120	126	128	124	124.67
Bagavathi	48	f	154	62	118	124	126	122	124	128	126	125
Latha	25	f	158	58	124	138	122	140	128	124	128	130
Jamuna	29	f	160	64	118	122	128	124	126	128	124	125.33
Sumathy	37	F	156	62	124	126	140	124	138	128	126	130.33
Rani	56	f	162	65	110	114	116	118	112	118	114	115.33
mari regina	35	f	158	56	126	142	128	138	126	124	128	131
Santhakumar	40	f	156	58	118	124	128	124	132	126	126	126.67
Lakshikantha	60	m	168	70	124	124	138	120	138	122	124	127.67
Uma	32	f	158	62	118	122	124	128	126	130	124	125.67
Mookayee	40	f	162	64	126	122	138	130	136	128	130	130.67
Subaiya	60	m	174	76	120	122	124	126	124	124	128	124.67
tamilarasi	40	f	164	62	128	126	142	124	140	122	126	130
Marimuthu	30	m	174	72	118	124	126	128	120	132	124	125.67
vasantha kun	45	f	160	58	124	144	122	142	124	126	128	131
Sakeela	47	f	162	64	116	124	126	128	126	128	128	126.67
shanthi	31	f	164	60	128	126	138	130	128	138	126	131
Karuppaiya	40	m	178	76	122	126	128	140	128	142	126	131.67
	42.68		160.88	61.28	121.52							127.68
	10.491		6.559472	6.99714227	4.51959							3.6874

ROPIVACAINE FENTANYL GROUP

NAME	AGE	SEX	PREOP DIA BP	POST OP DIAST BP	2	3	4	5	6	AVERAGE
Ravikoundan	57	m	82	84	88	90	86	84	82	85.667
Gurulaksmi	40	f	84	88	90	92	86	84	86	87.667
Anusuya	32	f	70	74	76	84	82	80	84	80
Meenakshi	40	f	86	88	90	92	86	86	84	87.667
Dhanalaksmi	40	f	78	80	84	86	88	78	82	83
Mary	55	f	74	78	82	84	86	76	74	80
Vasantha	50	f	82	84	88	86	84	84	82	84.667
periyakkal	58	f	84	86	88	84	90	84	86	86.333
Bagavathi	48	f	76	78	80	86	84	88	82	83
Latha	25	f	86	88	82	78	76	74	82	80
Jamuna	29	f	74	78	80	74	76	84	82	79
Sumathy	37	F	78	80	84	82	78	86	78	81.333
Rani	56	f	82	88	90	82	84	82	78	84
mari regina	35	f	80	84	82	86	84	82	86	84
Santhakumari	40	f	70	82	84	72	78	82	84	80.333
Lakshikanthan	60	m	68	74	70	76	82	72	84	76.333
Uma	32	f	66	72	68	70	82	84	82	76.333
Mookayee	40	f	72	78	80	86	88	84	82	83
Subaiya	60	m	74	78	76	74	84	88	86	81
tamilarasi	40	f	80	88	92	82	78	76	84	83.333
Marimuthu	30	m	78	80	82	88	86	84	86	84.333
vasantha kumari	45	f	80	84	86	82	80	78	88	83
Sakeela	47	f	82	84	86	88	82	88	80	84.667
shanthi	31	f	70	74	76	78	72	82	84	77.667
Karuppaiya	40	m	72	74	78	80	82	76	84	79
	42.68		77.12							82.213
	10.491		5.83324							3.2014

ROPIVACAINE FENTANYL GROUP

NAME	AGE	SEX	PAIN SCORE	2	3	4	5	6	AVERAGE	ADJUVANT	SEDAT
Ravikoundan	57	m	2	3	3	2	3	2	2.5	0	2
Gurulaksmi	40	f	2	1	2	1	2	2	1.6	0	2
Anusuya	32	f	0	1	1	2	1	1	1	0	2
Meenakshi	40	f	1	1	5	2	4	2	2.5	2	2
Dhanalaksmi	40	f	1	2	5	2	6	2	3	2	2
Mary	55	f	1	2	2	1	2	1	1.5	0	2
Vasantha	50	f	1	5	2	4	1	2	2.5	2	2
periyakkal	58	f	1	2	1	2	1	2	1.5	0	2
Bagavathi	48	f	1	2	1	2	2	1	1.5	0	2
Latha	25	f	1	5	2	6	2	2	3	2	2
Jamuna	29	f	0	2	1	1	1	1	1	0	2
Sumathy	37	F	1	4	2	5	2	2	2.666667	2	2
Rani	56	f	1	2	1	2	1	2	1.5	0	2
mari regina	35	f	1	6	2	5	2	2	3	2	2
Santhakumari	40	f	1	2	2	1	2	2	1.666667	0	2
Lakshikantha	60	m	1	5	2	2	4	2	2.666667	2	2
Uma	32	f	1	2	2	1	1	2	1.5	0	2
Mookayee	40	f	2	6	2	5	2	2	3.166667	2	2
Subaiya	60	m	0	2	2	2	2	2	1.666667	0	2
tamilarasi	40	f	0	5	2	5	2	2	2.66	2	2
Marimuthu	30	m	1	2	2	2	2	1	1.666667	0	2
vasantha kum	45	f	5	2	4	2	2	2	2.833333	2	2
Sakeela	47	f	2	1	2	2	2	2	1.833333	0	2
shanthi	31	f	2	5	3	2	5	2	3.166667	2	2
Karuppaiya	40	m	2	2	5	2	4	1	2.666667	2	2
	42.68								2.1704		
	10.491										